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HERBERTIA

VOLUMES 6-10

1939-1943

EDITED BY

HAMILTON P. TRAUB



SALINAS, CALIFORNIA

THE AMERICAN AMARYLLIS SOCIETY

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- VOLUME 6. HERBERTIA 1939; pp. 258.
Published January, 1940; Copyright 1940.
- VOLUME 7. HERBERTIA 1940; pp. 242.
Published March 1941; Copyright 1941.
- VOLUME 8. HERBERTIA 1941; pp. 186.
Published January 1942; Copyright 1942.
- VOLUME 9. HERBERTIA 1942; pp. 243.
Published May 1943; Copyright 1943.
- VOLUME 10. HERBERTIA 1943; pp. 205.
Published July 1944; Copyright 1944.

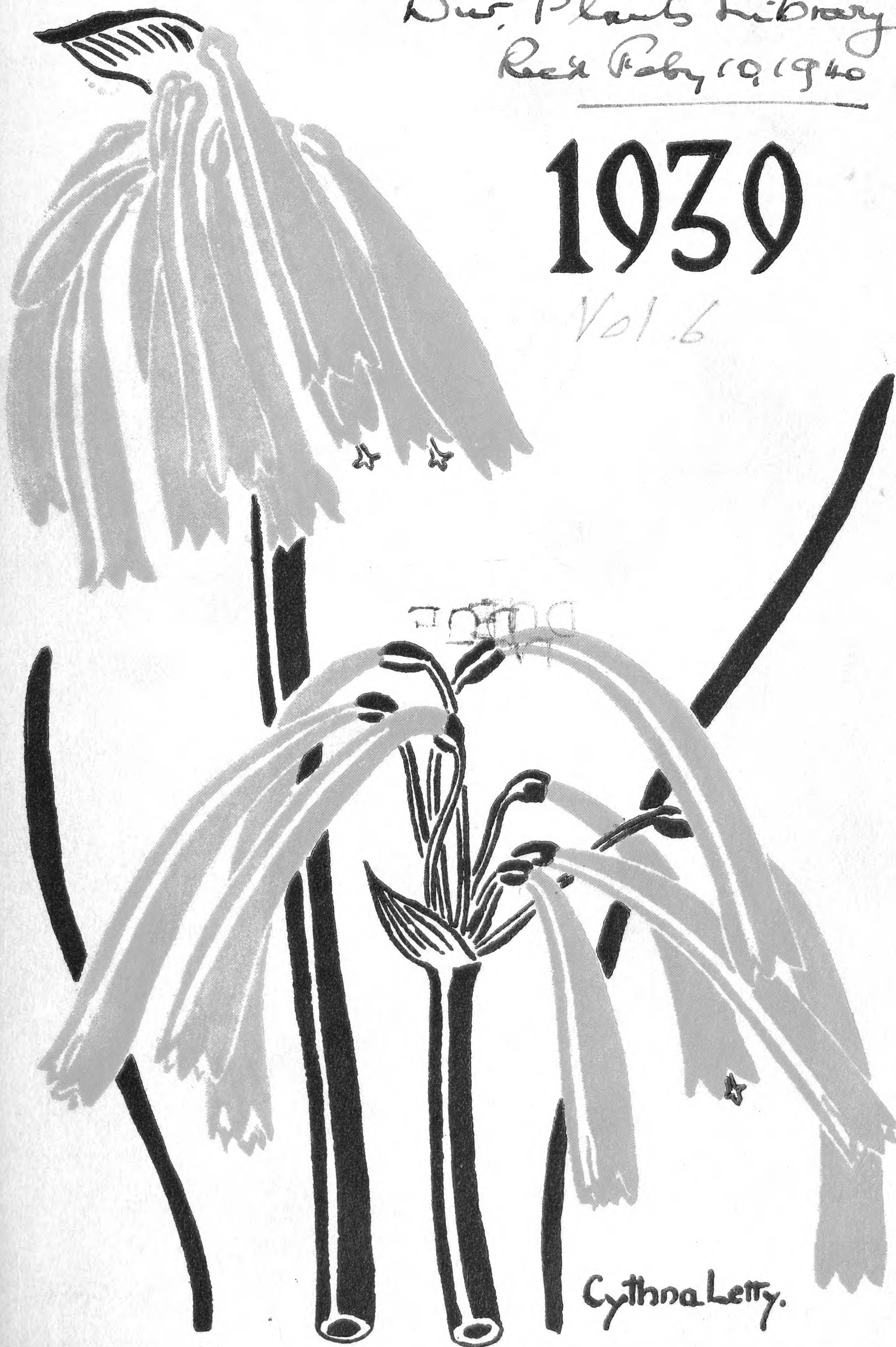
Volumes 6 to 10, inclusive, contain 1129 pages, including 209 illustrations
[144 plates and 65 text figures].

HERBERTIA

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1939

Vol. 6



Cynthia Letty.

HERBERTIA

VOLUME 6

DEDICATED TO
THE UNION OF SOUTH AFRICA

EDITED BY
HAMILTON P. TRAUB
Mira Flores, Orlando, Florida

ORLANDO, FLORIDA
THE AMERICAN AMARYLLIS SOCIETY
1939

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AMERICAN AMARYLLIS SOCIETY

Printed in the United States of America

Published January, 1940



This volume contains forty-four plates and ten figures.

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INTRODUCTION

It is a signal honour, yet one not undeserved, that this volume of *Herbertia* should be dedicated to the Amaryllidaceae of Southern Africa. From the earliest days of botanical exploration at the Cape of Good Hope, more than 250 years ago, South African Amaryllidaceae have been among the foremost favourites in cultivation overseas. That they have made notable contributions to horticulture is obvious from their sustained popularity.

Although few of the South African species approach the true *Amaryllis* (*Hippeastrum*) in size of flowers, what the majority lack in this respect, they amply make up in artistic effect. The genus *Nerine* soon came into prominence by reason of the outstanding species *Nerine sarniensis*, which was one of the first to meet the collector's eye on the Cape Peninsula. *Callicore rosea* Link, the misnamed Cape "Belladonna Lily", and *Crinum longifolium* Thunb., were also early in cultivation in Holland and elsewhere. Later various species of *Haemanthus* and *Cyrtanthus* and *Vallota speciosa* D. & S. "George Lily" etc., began to find a permanent place in European gardens, until today there can be few countries in which South African Amaryllidaceae are not represented in cultivation.

Evidence of appreciation of the family in South Africa is not lacking, but unlike many overseas gardeners, few local gardeners have devoted serious attention to the fascinating study of hybridisation. It is confidently anticipated that time will show considerable advance in this direction, encouraged by the valuable information contained in *Herbertia*.

This is not the first volume of *Herbertia* in which South African Amaryllidaceae have been prominently featured. In the preface to volume 3 (1936) it was observed by the editor that "Messrs. Dyer and Compton in South Africa are opening up a wonderland of Amaryllid species". In that volume the former botanist contributed an article entitled "An Introduction to the South African Amaryllidaceae", while the latter gave a systematic list of the "Amaryllidaceae Native in the Union of South Africa". Several short articles on various South African species have appeared in the two subsequent volumes.

The dedication of this volume of *Herbertia* to the Amaryllidaceae of Southern Africa will undoubtedly stimulate greater interest in our wonderfully rich flora. In popularising Amaryllidaceae throughout the world, the American Amaryllis Society is to be congratulated on its broad vision and enterprise.

(Signed) W. R. Collins

Minister of Agriculture and Forestry,
Union of South Africa

Pretoria,
5. 5. 1939.

INLEIDING

Dit is 'n besonder, dog nie onverdiende eer dat hierdie boekdeel van Herbertia aan die Amaryllidaceae van Suidelike Afrika opgedra is. Vanaf die vroegste tyd van plantkundige ondersoek aan die Kaap die Goeie Hoop, meer as 250 jaar gelede, is die Suid-Afrikaanse Amaryllidaceae onder die mees gewilde plante wat in die buiteland gekweek word. Die feit dat hulle merkwaardige bydraes tot tuinbou gelewer het, blyk uti hul voortdurende gewildheid.

Hoewel min van die Suid-Afrikaanse soorte ten opsigte van die grootte van die blom met die egte *Amaryllis* (*Hippeastrum*) vergelyk kan word, vergoed die kunsvolle vertoning wat die meeste van hulle maak, vir tekortkoming in hierdie opsig. Die geslag *Nerine* het gou bekend geraak as gevolg van die mooi soort *Nerine sarniensis*, wat een van die eerste plante was waarop die oog van die versamelaar in die Kaapse Skiereiland geval het. *Callicore rosea* Link, die verkeerd genoemde Kaapse "Belladonna-lelie", en *Crinum longifolium* Thunb., is ook in Holland en elders gekweek. Later het verskillende soorte van *Haemanthus* en *Cyrtanthus* en *Vallota speciosa* D. & S. "Georgelelie" ens, 'n blywende plek in Europese tuine begin inneem, totdat daar vandag seker min lande is waar die Suid-Afrikaanse Amaryllidaceae nie gekweek word nie.

Daar is geen gebrek aan blyke van waardering van hierdie familie in Suid-Afrika nie, maar, in teenstelling met baie tuiniers in die buitenland, bestee min plaaslike tuiniers ernstige aandag aan die boeiende studie van kruising.

Ons vertrou dat daar met verloop van tyd heelwat vordering in hierdie rigting gemaak sal word, gedeeltelik as gevolg van die waardevolle inligting wat in Herbertia vervat is.

Dit is nie die eerste boekdeel van Herbertia waarin Suid-Afrikaanse Amaryllidaceae op die voorgrond gebring word nie. In die voorwoord van boekdeel 3 (1936) merk die redakteur op dat mnre. Dyer en Compton in Suid-Afrika 'n worderland van Amaryllidaceae onder die aandag bring. In dié boekdeel het eersgenoemde plantkundige 'n artikel getiteld "An Introduction to the South African Amaryllidaceae", bygedra, terwyl laasgenoemde 'n stelselmatige lys van die Amaryllidaceae wat in die Unie van Suid-Afrika inheems is, gegee het. Etlike kort artikels oor verskillende Suid-Afrikaanse soorte het in twee latere boekdele verskyn.

Die opdragting van hierdie boekdeel van Herbertia aan die Amaryllidaceae van Suidelike Afrika sal ongetwyfeld groter belangstelling in ons wonderskone flora opwek. Ons moet die "American Amaryllis Society" gelukwens met sy wye insig en ondernemingsgees, wat Amaryllidaceae dwarsdeur die wêreld gewild gemaak het.

W. R. Collins,

Minister Van Landbou en Bosbou,
Unie Van Suid-Afrika

Pretoria,
5. 5. 1939.

PREFACE

South Africa will forever be closer to us thanks to the splendid co-operation of a distinguished group of men and women of the Union—W. R. Collins, Dr. R. A. Dyer, Mrs. Bolus, Prof. R. H. Compton, Frances M. Leighton, Winsome F. Barker, R. H. Marloth, E. P. Phillips, L. B. Creasey, I. C. Verdoorn, Edith L. Stephens, G. Milne-Redhead, Cythna Letty, Gladys I. Blackbeard, K. C. Stanford, John Martley and Mrs. J. W. Archbell. They have all wholeheartedly given effort and time, and they have without doubt made this, the South African Edition, one of the most outstanding issues of *Herbertia*. To all of them we send our heartfelt thanks for this wonderful demonstration of international good will. Dr. Dyer refers to the article by Gladys I. Blackbeard, and the work of John Martley, Mrs. Archbell and others in the “Foreword” immediately following. In this brief Preface we can no more than mention the others.

Miss Cythna Letty contributes the beautiful cover design featuring *Cyrtanthus Tuckii* var. *transvaalensis*. This portrays the highly decorative value of *Cyrtanthus*, and will be an inspiration to all.

The reader will linger long over the valuable articles by Frances M. Leighton on the history of botanical exploration for amaryllids in South Africa, the distribution of amaryllids as related to rainfall, and the review of the important Genus *Agapanthus* that has been so long neglected.

Dr. Dyer contributes the very valuable revision of *Cyrtanthus*, the most important Genus among the amaryllids of South Africa in number of species, and possibly also from a horticultural standpoint, especially when we consider the great possibilities for the hybridizer. The many *Cyrtanthus* enthusiasts in America will welcome this excellent review. The great wealth of line drawings is especially noteworthy for quality.

Miss Winsome F. Barker has favored us with the valuable summary of amaryllids discovered in South Africa since 1888.

After reading Edith L. Stephens' article on *Gethyllis*, there will be hardly a member of the Society who will rest until he or she has tried this fascinating subject in the garden, or under pot culture.

Other excellent articles are furnished by J. B. Creasey, K. C. Stanford, I. C. Verdoorn, E. P. Phillips, John Martley, G. Milne-Redhead, and Mrs. Archbell.

In addition to the valuable contributions from South Africa, there is a wealth of material from members in other parts of the world and at home. We take a glance at amaryllid culture under glass in Denmark. Jan de Graaff has written several stimulating articles on narcissi—shows, varieties, mechanization of the industry, plant nutrition, and forcing. Col. Steichen gives us a much needed review of the R. H. S. Color Chart. Dr. Hume's article on the “*Zephyranthes* of the West Indies” is the first of an important series.

Dr. Hutchinson introduces us to the entirely neglected *Gilliesiae*, including three of his inimitable line drawings that we will cherish always. Although we are already greatly in debt to him for his arrangement of the amaryllids, we are now still more in the red to Sir Arthur W. Hill, Director of Kew, and Dr. Hutchinson, for this very great favor. We trust that some of the members in South America will find it possible

to send ample herbarium material of the *Gilliesiae* to Kew as a partial repayment.

The daylily is receiving more and more attention as the movement for their popularization gains momentum. Col. Steichen presents a report of the Daylily Committee that shows progress. Dr. Steward, in China, tells of the discovery of *Hemerocallis fulva rosea*, and *H. multiflora*. These were originally sent to the New York Botanical Garden, and are revolutionizing the breeding of this plant. Mr. Kelso again favors us with daylily ratings for garden value; Dr. Stout continues his list of newly named daylilies, and Dr. Leonian shares with us his adventures in breeding red daylilies. Mr. Leach writes on the culture of daylilies in California. In the next issue of *Herbertia* we plan to increase the space devoted to daylilies, and we ask your cooperation in sending in articles on all phases of daylily culture. One article has already been received—Mrs. Dewey presents a review of the breeding work with daylilies carried on by Mrs. Nesmith. Similar articles about the work of all the younger daylily breeders are urgently solicited.

The reader will be interested in the articles on cytology by Dr. Flory. It is this kind of research that will serve as a sound foundation for further advances. We take this opportunity of expressing the gratitude of the Society to Dr. Flory and the Texas Agricultural Experiment Station.

Since the last issue of *Herbertia*, Sealy has suggested the conservation of the *invalid* genus name, *Hippeastrum*! The members will want to read Dr. Uphof's critical review of Sealy's paper. In the previous issue of *Herbertia*, Dr. Uphof showed that *Amaryllis belladonna* is the *valid* name for an American amaryllid because Linnaeus indicated plainly in the first edition of *Species Plantarum*, 1753, the foundation of the nomenclature of vascular plants, what he considered as the type-illustration of this American amaryllid. Dr. Uphof shows in this issue that common usage upholds this method of typifying Linnean species; that there was no confusion about this matter as early as 1758, and that it was only after the 18th. Century that the subject was befuddled by one or two individuals. The reader can readily perceive the undesirability of validating plant names by means of "blank" specimens and the use of circumstantial evidence unlimited. Dr. Uphof points out that "no argument can ever be drawn from silence". There is a time and place for everything. Attempts of this kind may be appropriate in such disciplines as archeology where speculation is necessary in some cases to have any interpretation at all, but certainly is out of place in establishing plant names when Linnaeus himself indicated unmistakable type-illustrations.

Volume 7, *Herbertia*, 1940, will be dedicated to Latin America. The main feature will be the amaryllids of Mexico, Central America, the West Indies, and South America. Some of the material has already been received. Mr. Rice has sent in most excellent "portraits" of *Childanthus* and *Sprekelia*. Dr. Uphof contributes an article on *Alstroemerias*, and C. V. Morton favors us with "A Checklist of Amaryllidaceae, Tribe Allieae, in the United States".

Hamilton P. Traub

New York City,
Sept. 9, 1939

FOREWORD

When plans were originally being laid for the dedication of this volume to the Amaryllids of South Africa an ambitious "List of Contents" was proposed from the Editorial chair. Although all the "castles in the air" have not materialised, we in South Africa, hope that our contributions will be of some interest to the readers of *Herbertia*. When it is realized that the Union of South Africa covers an area of 472,550 square miles, in any square yard of which an amaryllid may be found, and that the total white population is only 2 million odd, of which about 1/6 is centered round the gold mining industry, it may not occasion great surprise that Amaryllid activity is meagre compared, for instance, with that in the United States of America. Added to this the natural modesty of most South Africans, my attempts to elicit information on such subjects as Hybridisation, Propagation, Harvesting, Storage and Forcing have not been very fruitful. The following is an extract from one reply to a circular letter: "All my work, well over 30 years, has been with the hybrids and all seedlings have been the result of recorded hand work, but I fear that I could write little that would be of interest to the public for whom *Herbertia* is printed". I wonder if this is so!

Some articles intended for this year's volume have passed through my hands and I should like to draw attention to the one by Miss G. Blackbeard on hybridisation with species of *Clivia*. As evidenced in 1935 *Herbertia*, workers in other countries are ahead of us in this work, for instance E. K. Cowlshaw in Australia and E. P. Zimmerman in California, both of whom have propagated remarkably fine hybrids. I have little doubt, however, that Miss Blackbeard's results will stimulate a desire for fuller information. *Clivia* hybrids have great possibilities and her pioneer work in South Africa with them will be appreciated by all and will encourage some to follow her example. Another interesting article is by Miss K. Stanford and anyone reading it will realize that she has an intimate knowledge and love for the indigenous amaryllids.

Interesting developments are taking place also in the garden of Mr. John Martley of Banhoek, Stellenbosch, who is already known to readers. He is building up a large collection of South African Monocotyledons in which Amaryllidaceae are a prominent feature. Hybridisation is a hobby at Banhoek which promises to yield profitable results as time goes on. One of the first fruits is a repetition of the cross between *Vallota speciosa* (= *V. purpurea*) and *Cyrtanthus sanguineus*. Mr. Martley mentions that there was an excessive endosperm in the seeds which burst out of the testa. If seed was stored it withered and died within two weeks or so, whereas that planted immediately after picking germinated without delay.

Messrs. Hurling and Neil, of Bonnie Vale in the Cape Province, pay more attention to South African succulents than to the amaryllids, nevertheless, these growers have oversea connections in amaryllid dealings. Several interesting species are indigenous in their area. The bulb of *Brunsvigia Josephinae* is said to attain an enormous size, reaching a circumference of about 26 inches and growing mostly above ground.

Messrs. de Mole and Kisch who have a floral farm in the neighbourhood of Pietermaritzburg, Natal, grow only those amaryllid species which "need no special attention".

In the introduction to my review of the genus *Cyrtanthus*, published in this volume, I made mention of the popularity in cultivation of *Cyrtanthus Mackenii* (Ifafa Lily). One of the successful growers is Mrs. J. Archbell of Willow Glen, Umkomaas, Natal. She has Ifafa Lilies ranging in colour "from pure white to deep red, exquisite peach pink, yellow and many other shades". The common name may here cover more than one of our so called species. Mrs. Archbell finds that species of *Cyrtanthus* generally, respond well in a mixture of sandy loam, leaf mould and a little wood ash and soot. This, however, does not apply to such species as *C. contractus*, one of the "fire lilies" previously incorrectly referred to under the name *C. angustifolius*, with which growers have had little success. The bulbs more often than not either rot or dwindle after being brought into cultivation.

Agapanthus, a comparatively recent acquisition to the Amaryllids, which is featured elsewhere in this Herbertia, enjoys a great measure of popularity in gardens. Without special attention it makes an attractive evergreen border plant and flowers freely. In the related genus *Tulbaghia* there is an attractive species, which has a very pleasant perfume instead of the strong garlic smell usually associated with species of this genus. In some gardens it has been cultivated under the name *T. fragrans** and in others as *T. pulchella*, but the former is the first valid name for the species. *T. fragrans* was discovered not many years ago in the mountains of the eastern Transvaal and within very recent times has spread extensively in South African gardens. It flowers freely in winter provided severe frosts are not experienced. It is destined to become a particular favourite in horticulture.

The genus *Ammocharis* is often referred to in accounts of Amaryllids from South Africa and the specific epithet most frequently used is *A. falcata*. Researches carried out at Kew by Mr. Milne-Redhead and Dr. H. G. Schweickerdt have made it necessary to make certain changes in the present accepted classification, including the creation of a new genus. The ms. of the paper embodying the results should go to press shortly and until it appears in print further comment would be inopportune.

In viewing this volume of Herbertia dedicated to the Amaryllidaceae of Southern Africa, contributions in earlier numbers should not be overlooked. In 1936 Professor Compton gave a complete list of "Amaryllidaceae in the Union of South Africa" and in the same year the present writer contributed an article "An Introduction to the South African Amaryllidaceae". There have been several short articles by various authors dealing with *Cyrtanthus*, *Nerine*, *Haemanthus*, *Clivia* and other popular genera. One should not neglect to refresh ones memory with

(Continued on bottom page 13)

**T. fragrans* Verdoorn, 1931 (= *T. pulchella* Barnes non Avé-Lallemant; *T. Daviesii* Gray, 1938).

TABLE OF CONTENTS

	PAGE
South African Edition Cover Design, <i>Cyrtanthus Tuckii</i> var. <i>transvaalensis</i> , by Cythna Letty.	
Introduction, W. R. Collins.....	3
Inleiding, W. R. Collins.....	4
Preface	5
Foreword, Dr. R. A. Dyer.....	7
Errata, Vol. 5, HERBERTIA, 1938.....	13
Dedication	14
The History of Botanical Exploration for Amaryllids in South Africa, Frances M. Leighton	15
What South Africa is doing to Popularize its Native Species of Amaryllids, E. P. Phillips	24
Biographical Sketches.....	26
Prof. R. H. Compton.....	26
Frances M. Leighton.....	26
Winsome F. Barker.....	26
Herbert Medalists, 1939.....	27
Dr. J. Hutchinson, a Biographical Sketch, Sir Arthur W. Hill.....	27
Arthur Burdette Stout, an autobiography.....	30
Sydney Percy Lancaster, an autobiography.....	40
Carl Purdy, an autobiography.....	43
Fred H. Howard, an autobiography.....	45
In Memoriam—Richard Diener, Bertha L. Lighton	49
Soils and Men, a review, Dr. R. V. Allison.....	50
Grey's "Hardy Bulbs," Hamilton P. Traub.....	51
In Memoriam—Albert G. Ulrich, Sr.....	53
Sir John Hill, 1716-1775.....	53
1. REGIONAL ACTIVITIES AND EXHIBITIONS	
Autumn National Amaryllis Show, Pomona, Calif., Sept. 22-23, 1938, Cecil Houdyshel	54
Impressions of the National Amaryllis Show, Jacksonville, Fla., Apr. 11, 1939, Eva Noble	55
Two Daffodil Shows in Mid-Winter; Sassenheim, Dec. 23, 1938, and Haarlem, Jan. 2, 1939, Jan de Graaff.....	58
Mohr Amaryllis Exhibit, Copenhagen, Denmark, 1938, Wyndham Hayward....	60
The 1939 Amaryllis Show of the Bureau of Plant Industry, U. S. Dept. of Agriculture	61
National Amaryllis Show, 1940.....	61
2. COLOR DESCRIPTION	
Review of R. H. S. Color Chart, Col. Edward Steichen.....	63
3. DESCRIPTION, CLASSIFICATION AND PHYLOGENY	
A Review of the Genus <i>Cyrtanthus</i> , Dr. R. A. Dyer.....	65
A Brief Review of the Genus <i>Agapanthus</i> , Frances M. Leighton.....	105
South African Amaryllidaceae Discovered since 1888, Winsome F. Barker.....	108
Chance Meetings with Amaryllids in Four Corners of the South African Veld, I. C. Verdoorn.....	111
Notes on <i>Gethyllis</i> , Edith L. Stephens.....	112
<i>Amaryllis Kromerii</i> Worsley, sp. nov.....	117
<i>Worsleya</i> , subgenus nov.....	118
<i>Cooperia Smallii</i>	119
<i>Zephyranthes</i> of the West Indies, H. Harold Hume.....	121
The Tribe <i>Gilliesieae</i> of Amaryllidaceae, Dr. John Hutchinson.....	136
Correct Spelling of <i>Boöphone</i> Herb., G. Milne-Redhead	145
Further Revision of the Genus <i>Amaryllis</i> , Hamilton P. Traub and J. C. Th. Uphof.....	146

TABLE OF CONTENTS—(*Continued*)

	PAGE
Registration of Varieties.....	155
Hybrid Amaryllid Introductions, 1939.....	155
Daylily Introductions, 1939.....	155
Newly Named Daylilies, Dr. A. B. Stout.....	157
An Amaryllid Herbarium, Dr. L. H. Bailey.....	162
Critical Review of Sealy's "Amaryllis and Hippeastrum," Dr. J. C. Th. Uphof	163
Hemerocallis in Eastern and Central China, Dr. Albert N. Steward.....	168
Rating of Daylily Varieties for Garden Value, Season 1938, George DeWitt Kelso	172
On the Status of the Daylily, Col. Edward Steichen.....	181
Daffodil Varieties: Work in Progress and Food for Thought, Jan de Graaff....	184
Clivia Gardeni.....	189
 4. CYTOLOGY, GENETICS AND BREEDING	
Clivia Breeding, Gladys I. Blackbeard.....	191
Cytological Confirmation of Taxonomy in Cooperia, Dr. Walter S. Flory.....	194
Parthenogenesis in Zephyranthes, Dr. Walter S. Flory.....	196
Adventures in Breeding Red Hemerocallis, Dr. Leon H. Leonian.....	202
Amaryllis Breeding, Hermon Brown.....	203
Additional Notes on Amaryllis reticulata-stylosa Crosses, Sydney Percy Lancaster	205
 5. PHYSIOLOGY OF PROPAGATION	
Treatment of Seeds with Hormone Powder, W. M. James.....	206
 6. AMARYLLID CULTURE	
The Distribution of South African Amaryllids in Relation to Rainfall, Frances M. Leighton.....	207
Amaryllidaceae in a Cape Nursery, K. C. Stanford	211
Callicore Rosea in its Native Habitat, L. B. Creasey.....	214
Callicore Rosea and Brunsdonnas, E. O. Orpet	221
Callicore Rosea for the Middle Atlantic States and the South, Thomas Finley Martin.....	224
Ammocharis falcata, John Martley.....	225
Tulbaghia Culture, Mrs. J. W. Archbell	228
Amaryllis procera and Garfieldii Hybrids, Frank Vasku.....	228
Hemerocallis in California, Frank A. Leach.....	229
Milla Biflora, W. M. James	230
House Culture of Amaryllis, John F. Ruckman.....	231
Amaryllis Culture in Manitoba, R. W. Kenney.....	234
Daffodil Notes: Varieties, Mechanization of the Bulb Industry, and Boron in Bulb Nutrition, Jan de Graaff.....	235
Bomarea Caldasiana, Harry L. Stinson.....	238
 7. HARVESTING, STORAGE AND FORCING	
Daffodil Forcing Demonstrations in Holland, Jan de Graaff.....	239
 8. THE SOCIETY'S PROGRESS	
The Secretary's Mail Bag.....	240
Secretary's Message	243
Notice of Nominations 1940.....	245
Report of the Trial Collections Committee.....	245
Officers and Committees.....	247
Publications of the American Amaryllis Society.....	249
 The Buyers' Guide	
Advertising—A Forward Looking Policy, John R. Heist.....	251
Advertisements	252

LIST OF ILLUSTRATIONS—PLATES

	PAGE
Plate 124 Frontispiece Portrait—Dr. E. E. Galpin, reproduced from photograph in the Bolus Herbarium Museum.....facing page	15
Plate 125 Portrait—Dr. R. Marloth, reproduced from photograph furnished by Raimund K. Marloth.....	19
Plate 126 Map showing the Journeys of Thunberg, Burchell, and Derge.....	21
Plate 127 Portraits—Prof. R. H. Compton, Frances M. Leighton, Winsome F. Barker and L. B. Creasey.....	25
Plate 128 Portrait—Dr. J. Hutchinson—Herbert Medalist, 1939.....	28
Plate 129 Portrait—Dr. A. B. Stout—Herbert Medalist, 1939.....	35
Plate 130 Portrait—Sydney Percy Lancaster—Herbert Medalist, 1939.....	41
Plate 131 Portrait—Carl Purdy—Herbert Medalist, 1939.....	44
Plate 132 Portrait—Fred H. Howard—Herbert Medalist, 1939.....	47
Plate 133 R. S. Wolfe Exhibit, National Amaryllis Show, Jacksonville, Fla., Spring, 1939.....	56
Plate 134 Mohr Exhibit, Copenhagen Flower Show, 1938; and Mohr Bros. amaryllis greenhouse, Glostrup, Denmark.....	59
Plate 135 <i>Cyrtanthus Mackenii</i> in a Pretoria South Africa Garden.....	67
Plate 136 Distribution Map of <i>Cyrtanthus</i> in South Africa.....	68
Plate 137 <i>Cyrtanthus obliquus</i> and <i>C. carneus</i>	77
Plate 138 <i>Cyrtanthus falcatus</i> , <i>C. Mackenii</i> , <i>C. flavus</i> and <i>C. Mackenii</i> var. <i>Cooperi</i>	78
Plate 139 <i>Cyrtanthus attenuatus</i> sp. nov., <i>C. Flanaganii</i> , <i>C. rotundilobus</i> , and <i>C. parviflorus</i>	81
Plate 140 <i>Cyrtanthus epiphyticus</i> , <i>C. bicolor</i> , <i>C. Huttoni</i> , and <i>C. rhododactylus</i>	82
Plate 141 <i>Cyrtanthus Junodii</i> , <i>C. Tuckii</i> var. <i>transvaalensis</i> , <i>C. striatus</i> , and <i>C. angustifolius</i>	89
Plate 142 <i>Cyrtanthus pallidus</i> , <i>C. Fergusoniae</i> , <i>C. odoratus</i> , and <i>C. inaequalis</i>	90
Plate 143 <i>Cyrtanthus contractus</i> , <i>C. leucanthus</i> , <i>C. spiralis</i> , and <i>C. collinus</i>	97
Plate 144 <i>Cyrtanthus Guthrieae</i> , <i>C. sanguineus</i> , <i>C. helictus</i> , and <i>C. clavatus</i>	98
Plate 145 <i>Cyrtanthus ventricosus</i> , and <i>C. vittatus</i>	101
Plate 146 <i>Agapanthus orientalis</i>	104
Plate 147 <i>Agapanthus longispathus</i> , and <i>A. pendulus</i>	107
Plate 148 <i>Gethyllis afra</i>	115
Plate 149 <i>Zephyranthes bifolia</i> (Aublet) Roemer.....	120
Plate 150 <i>Zephyranthes insularum</i> n. sp.....	124
Plate 151 <i>Zephyranthes Plumierii</i> n. sp.....	126
Plate 152 <i>Zephyranthes rosea</i> Lindley.....	129
Plate 153 <i>Zephyranthes tubispatha</i> (Gawler) Herbert.....	131
Plate 154 <i>Trichlora peruviana</i> Baker.....	140
Plate 155 <i>Ancrumia cuspidata</i> Harv.....	144
Plate 156 Portrait—Dr. A. N. Steward.....	167
Plate 157 Native home of <i>Hemerocallis fulva rosea</i> —Lushan, or Lion's Leap Mountain, No. Kiangsi Province, China.....	169
Plate 158 Native home of <i>Hemerocallis multiflora</i> —Scenes near Kikungshan on Honan-Hupeh border, China.....	170
Plate 159 Hybrid Daylily varieties—Indian Chief, Florida, Emperor Jones, and Duchess of Windsor.....	173
Plate 160 <i>Clivia</i> breeding— <i>Clivia nobilis</i> ; <i>C. miniata</i> var. <i>flava</i> ; hybrid between the preceding; flowers of <i>C. nobilis</i> and <i>C. miniata</i> var. <i>flava</i>	190
Plate 161 <i>Clivia Gardenii</i> Hook.....	192
Plate 162 Map of South Africa showing relation of rainfall to distribution of amaryllids.....	209
Plate 163 <i>Nerine lucida</i> Herb.....	213
Plate 164 <i>Callicore rosea</i> Link, growing naturally on steep slope, spur of Table Mountain, South Africa.....	215
Plate 165 <i>Callicore rosea</i> hybrids—Brunsdonnas Hathor and Multiflora alba.....	223
Plate 166 <i>Tulbaghia violacea</i>	227
Plate 167 <i>Bomarea caldasiana</i>	237

FIGURES

	PAGE
Figure 35 <i>Haemanthus rotundifolius</i> Gawl. from Stapel's <i>Theophrastus</i> , 1644.....	17
Figure 36 <i>Zephyranthes Wrightii</i> Baker.....	133
Figure 37 <i>Speea humulis</i> Philippi.....	142
Figure 38 Daylilies and peanuts grown for food.....	168
Figure 39 Root tip cell of <i>Cooperia Traubii</i> showing 24 chromozomes, greatly enlarged	195
Figure 40 Drawings of pistil and ovule, <i>Habranthus texanus</i>	197
Figure 41 Diagrammatic sketches of steps in embryo sac formation in <i>Habranthus texanus</i>	199
Figure 42 Hermon Brown and his hybrid <i>Amaryllis</i>	204
Figure 43 <i>Ammocharis falcata</i>	226
Figure 44 <i>Milla biflora</i>	231

ERRATA

HERBERTIA, VOL. 5, 1938

- Page 7; 10th. line from bottom, for "Sept. 7" read "Aug. 7."
- Page 16; 4th. line from bottom, delete "only."
- Page 18; 9th. line from top, after "his son" delete the rest of the sentence and read "and since that day he entrusted to him the leadership of the firm in full confidence."
- Page 21; 13th. line from bottom, delete "Most of them bear names given by the firm" and substitute "To most of them the firm's authority as raiser is added."
- Page 26; 7th. and 8th. lines from top, for "Duc van Tol" read "late."
- Page 39; 17th. line from top, for "autocracy" read "autarcy."
- Page 43; 4th. line from top; delete "try" and insert "conserve and."
- Page 82; 5th. line from top, for "amaryllis" read "amaryllids."
- Page 112; 10th. line from top, for "Andronecium" read "Androecium."
- Page 113; 17th. line from bottom, for "tepels" read "tepals."
- Page 115; 1st. and 2nd. lines from top, for "35" read "38" in each case. 5th. and 8th. lines from top, for "34" read "37" in each case.
- Page 118; last line bottom of page, change "28" before "*viridiflora*" to "27," and in place of "29. *tucumana*" read "30. *Haywardii*."
- Page 121; 14th. line from bottom, for "1943" read "1843." 15th. line from bottom, for "*vicolor*" read "*bicolor*."
- Page 123; 4th. line from top, for "Peoppig" read "Poeppig."
- Page 124; 24th. line from top, for "*ambigum*" read "*ambiguum*."
- Page 128; 26th. line from bottom, for "*equistis*" read "*equestris*." 29th. line from bottom, delete "Leopoldia."
- Page 131; 2nd. line from bottom, foot-note 2, for "*breviflora*" read "*reticulata*."
- Page 136; 5th. line of text from top, for "*Eurora*" read "*Europa*."
- Page 167; title at top of page, for "STENOPETATA" read "STENOPETALA." 17th. and 18th. lines from top, for "*stenopetata*" read "*stenopetala*."

ERRATUM

HERBERTIA, VOL. 3, 1936

- Page 68; under "*Ammocharis*," the 3rd. species, for "*Traveliana*" read "*Taveliana*."

AGE OF THE LATE GEORGE YELD—A CORRECTION

The Gardeners' Chronicle, April 9, 1938, p. 259, contains an obituary notice in which it is stated that Mr. George Yeld died April 2, 1938 at the age of *ninety-five*. "In Memoriam—George Yeld," by A. B. Stout, *HERBERTIA*, Vol. 5, p. 61, 1938 repeats the statement noted above. *The Gardeners' Chronicle*, August 10, 1935, p. 99, gave Mr. Yeld's age, at that time, as *ninety-three*. The issue of the *Gardeners' Chronicle* of March 17, 1935, p. 130, stated this to be an error and said that Mr. Yeld celebrated his *ninetieth* birthday in March, 1935. Mr. Yeld's age, therefore, at his death on April 2, 1938, was *ninety-three* years and a few days—depending on the date of his birthday in March.

—A. B. Stout.

INSTRUCTIONS FOR CONTRIBUTORS

Year Book Correspondence. Correspondence regarding articles and illustrations for *Herbertia*, the Year Book of the American Amaryllis Society, is cordially invited. The annual news-letter or articles from Corresponding Members and Regional Chairmen of Trial Collections should be forwarded, if at all possible, by April of each year, or earlier, depending upon the distance, so as to reach the editor in ample time for publication.

Manuscripts should be **typewritten** if at all possible and **double spaced**; photographs should have the **name of the owner** to whom credit should be given, and the **name and size of the subject**, written on the back.

(FOREWORD—DYER; *continued from page 7*)

these accounts, for each one in its way is a contribution to the knowledge of South African Amaryllidaceae.

From a vast natural store South African amaryllids have provided many valuable additions to horticulture. More await discovery and *Herbertia* may be looked upon as an insurance against the cessation of these notable contributions.

R. A. Dyer

*Division of Plant Industry,
Department of Agriculture and Forestry,
Pretoria, Union of South Africa,
July 26, 1939.*

*This volume of Herbertia
is dedicated to the Union of South Africa,
particularly to all the lovers of nature,
from the 17th. Century to the present time,
who interested, or interest, themselves in
the myriads of amaryllids of the veld.*



Bolus Herbarium

See page 23

Dr. E. E. Galpin, F. L. S.

Plate 124

THE HISTORY OF BOTANICAL EXPLORATION FOR AMARYLLIDS IN SOUTH AFRICA

FRANCES M. LEIGHTON,

Bolus Herbarium, University of Cape Town

This account will be rather in the nature of a general review of botanical exploration with special reference to Amaryllids since there have never been any collectors who gave this group their undivided attention.

The Cape of Good Hope was discovered towards the end of the fifteenth century by the Portuguese in quest of a sea route to the East. During the sixteenth and early seventeenth centuries, Table Bay was a port of call for the boats of the Dutch East India Company plying between Europe and the East in the spice trade. These vessels put into the bay for supplies of fresh water and for meat which they obtained by barter with the Hottentots who then inhabited the region.

Without doubt these early visitors took back with them some of the curious plants which they found growing round the shores of Table Bay. The first record of South African plants in literature as far as the writer knows, is in Johannes Bodaeus a Stapel's edition of Theophrastus published in 1644. The plants referred to in this book were collected by Justus Huernius, a minister of religion travelling to the Dutch East Indies. There are two figures of *Haemanthus rotundifolius* Gawl. which grows quite commonly round Cape Town, whether in flower or in leaf, could not fail to attract the attention of a stranger. (See Fig. 35.) Its massive bulb could endure many months of journeying over the sea.

In 1652 the Dutch East India Company decided to establish a provisioning station on the shores of Table Bay where vegetables could be grown, and fresh meat supplied to their ships on the long voyage to the East Indies. From this time onwards South African plants were taken back to the gardens of Holland which were then among the foremost in Europe. It is in the records of the gardens at Leiden and at Amsterdam that most of the early references to South African plants are found—in such works as Van Royen's Catalogue of the Leyden Botanical Garden and Commelin's Hortus Amstelodamensis. It is recorded that *Callicore rosea* was grown by Van Royen who sent bulbs to England in 1754. Later it was re-introduced by Sir Joseph Banks who collected it at the Cape when he called there on his return from the East Indies.

Paul Hermann, a botanist and physician who visited the Cape on his way to Ceylon sent specimens back to Holland which were lost when the ship carrying them was captured by British cruisers off St. Helena. Later, Hermann became a Professor at Leyden and his *Paradisus Bata-vus* (1698) contained many references to Cape plants but he does not state that he collected them himself.

During the Governorship of Simon van der Stel and that of his son Willem Adrian, expeditions were made into the interior and many new plants were found. The account of Simon van der Stel's journey to the copper mines of Namaqualand does not contain any figures of amaryllids

although he must have seen many of the unusual *Haemanthus* and *Gethyllis* which occur in the territory through which he passed. In some of Caspar Commelin's works he mentions receiving seeds from Willem Adrian van der Stel in 1700.

Since the chief object of establishing a settlement at the Cape was to provide fresh food for the scurvy-ridden crews of the East Indiamen, it was essential that, amongst the earliest settlers from Holland, there should be competent gardeners. Such men were Hartog, Oldenland and Auge who sent back the botanical rarities often figured in the works of Burmann and Boerhaave. In Burmann's *Prodromus* there are figures of *Agapanthus africanus* (L.). Hoffmaq and *Ammocharis falcata* Herb. Auge went on a collecting trip to Namaqualand in 1761 and later accompanied Thunberg and Masson on several expeditions.

Ryk Tulbagh was Governor at the Cape from 1751-1771 and during this time he corresponded with Linnaeus and sent him many specimens. Among these was the plant which Linnaeus called *Tulbaghia* and he says in a letter “. . . . a drawing of the *Tulbaghia* which plant will, I trust, remain a lasting monument to Your Honour, among botanists, as long as the vegetable tribe shall endure I wish, my honoured friend, that you would favour me with a bulb or two of your *Tulbaghia*, that it may be propagated and dispersed throughout the gardens of Europe so as to render your name familiar to all lovers of rare and beautiful plants.” Linnaeus concludes the letter with the following—“May you fully realise your own fortunate lot, not only in being permitted by the Supreme Disposer of events to inhabit, but also to enjoy the sovereign control of that paradise upon earth, the Cape of Good Hope, which the Beneficent Creator has enriched with his choicest wonders. Certainly, if I were at liberty to change my fortune for that of Alexander the Great or of Solomon, Croesus, or Tulbagh I should without hesitation prefer the latter.”

The first of the great botanical collectors who visited South Africa was Thunberg. He was a pupil of Linnaeus at Upsala and came to the Cape, owing to his limited financial resources, as an Assistant-Surgeon on one of the East Indiamen. He arrived in 1772 and spent three years travelling about the country in search of botanical specimens. He says of himself: “there never travelled a poorer lover of flowers than I, yet never one more ardent”.

Thunberg made three extensive journeys into the interior (shown in the accompanying map, Plate 126), and collected many specimens representing, *inter alia*, the following genera—*Haemanthus*, *Brunsvigia*, *Buphane*, *Crinum*, *Cyrtanthus*, *Strumaria*, *Agapanthus*, *Tulbaghia* and *Gethyllis*. To the last mentioned genus he makes the following reference in his *Travels* “Kukumakranka (*Gethyllis*) is the name given to the legumen or pod of a plant that grew at this time among the sand hills near the town, without either leaves or flowers. This pod was of the length of one's finger, somewhat wider at the top than at the bottom, had a pleasant smell and was held in great esteem by the ladies. The smell of it resembled in some measure that of strawberries and filled the whole room”. Thunberg enumerates four species of *Gethyllis* in his *Prodromus*.

Contemporary with Thunberg at the Cape was Francis Masson, a gardener from the Royal Gardens at Kew, sent out by William Aiton to collect seeds and plants. Sir Joseph Banks had been so impressed with the richness of the Cape Flora that he urged the King (George III) to send out a man to obtain specimens for the Royal Gardens. Masson came to the Cape in 1772 and accompanied Thunberg on two journeys. He collected a large number of bulbous plants as is shown in the *Hortus Kewensis* published in 1789. This work shows that, in 1774, he intro-

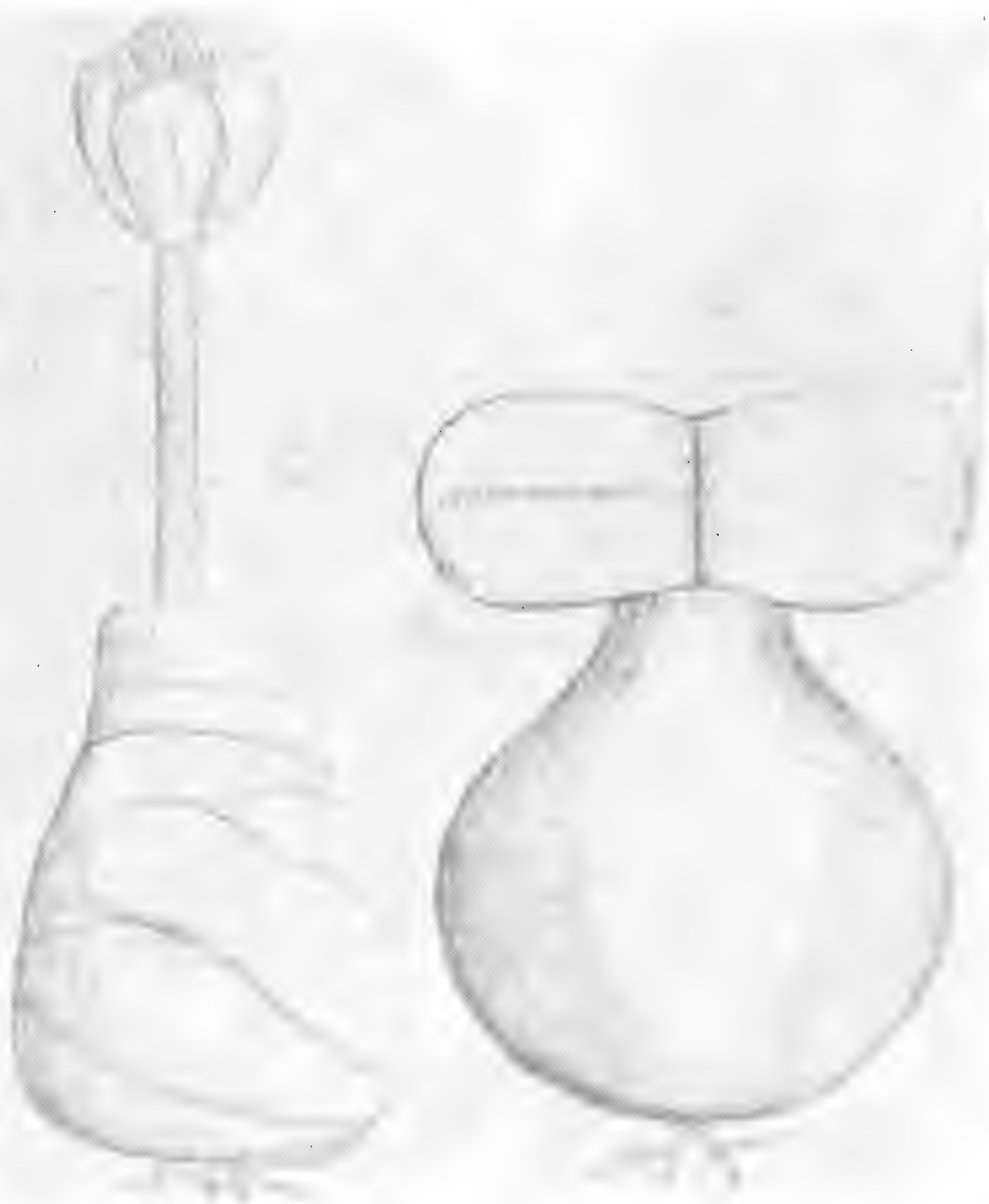


Fig. 35. *Haemanthus rotundifolius* Gawl. from Johannes Bodaeus a Stapel's *Theophrastus*, 1644.

duced the following amaryllids into the Royal Gardens at Kew—*Haemanthus pubescens* L. f., *Buphane ciliaris* Herb. (*Haemanthus ciliaris* Linn.), *Buphane disticha* Herb. (*Haemanthus disticha* L. f.), *Carpolyza spiralis* Salisb. (*Haemanthus spiralis* L. f.), *Hessea filifolia* Benth. (*Leucojum strumosum* Thunb.) *Tulbaghia alliacea* L. f. *Cyrtanthus angustifolius* Ait. *Cyrtanthus obliquus* Ait. *Vallota purpurea* Herb. (*Amaryllis purpurea* Ait.) *Ammocharis falcata* Herb. *Gethyllis villosa* L. f., *Gethyllis ciliaris* L. f.

Masson's name is perpetuated in the Liliaceous genus *Massonia*. There is some doubt whether the drawings which were executed at the Cape, of Stapelias and other plants were the work of Masson or that of a soldier of the garrison. Among these were some drawings of *Gethyllis*, one of which, *G. latifolia* Mass. ex Baker, has never been collected in the field since. The drawings of this genus were published by Baker in the *Journal of Botany* (1885) Vol. XXIII when he revised the genus *Gethyllis*.

Francis Masson returned to England and was sent to the Azores to collect. After visiting Portugal and Tangiers he again came to the Cape of Good Hope in 1786. This time he was strictly enjoined by Sir Joseph Banks to collect in the vicinity of False Bay and not to make costly excursions into the interior. Masson left the Cape in 1795 with his precious collections—"lest he should, in an unexpected invasion, lose the collection of living plants made during ten years residence here". The Cape was taken over by the British in 1795 to protect it against the French invasion which Masson had feared. He was later sent to North America and died in Montreal in 1805 at the age of 64.

Between the years 1777 and 1779 Lieut. William Paterson made four journeys into the interior. He went east almost as far as the Keiskamma River (long. 27E) and in the North he crossed the Orange River. Paterson mentions numerous strange plants in the account of his travels, among them *Buphane disticha* Herb. (*Amaryllis disticha*) which he found growing in large numbers in the Roggeveld. He says "Horned cattle are exposed to danger from the *Amaryllis disticha* or Poison bulb, with which the country is covered; they are extremely fond of its leaves which generally prove fatal". Under the figure of the plant he states that the bulb is used for poisoning arrows, and in an appendix he writes that this is known as "Mad Poison" from the effects usually produced on the animals wounded by weapons impregnated with it. The natives prepared it by slicing the bulbs at the time when the leaves were being produced and keeping the fluid obtained in the sun until it was of the consistency of gum.

In 1810 William J. Burchell arrived at the Cape. Burchell's Travels, with their wealth of information and anecdote and their copious illustrations, are perhaps the most interesting and delightful of all the records made by early travellers in South Africa. The route which Burchell followed is shown approximately in the accompanying map (Plate 126). In the map which he himself drew to illustrate his travels we find evidence all the way of Burchell the naturalist. His stations, when there was no name already attached, bear names such as these—Sugarbird Station, Cuckoo Station, Toad Station, Giraffe Station, Royena Halt. He went east to the Fish River and north into Bechuanaland and in the course of his travels collected many amaryllids. Burchell writes thus of *Amaryllis lucida* (*Nerine lucida* Herb.) which he found in Griqualand West—"A handsome and entirely new species of *Amaryllis* profusely covered a space of ground of half a mile in extent"—again referring to the same species he says ". . . we drove over an extensive field of thousands of the beautiful *Amaryllis lucida* in full bloom



Raimund H. Marloth, Nelspruit

See page 23

Dr. Rudolf Marloth

which gave the whole plain within view, the delightful appearance of a gay flower garden". He writes of the same scene 10 days later—"I looked now in vain for that rosy flower garden which decorated these plains on our former visit to the Asbestos Mountains. It had totally disappeared; and so astonishingly, and almost incredibly rapid is the progress of vegetation in these regions, with respect to bulbous plants, that in the short space of ten days, the beautiful lilies, then observed just coming into bloom, had completed their flowering, ripened their seed, the flower stems were dried up, and had parted from their roots and were nearly all blown away".

This quick growth after rain explains in some measure why some of the South African amaryllids are still imperfectly known. In writing of the Green Point Common Burchell gives another instance of this ephemeral character of the vegetation. He says, "The effect of the late rains was surprising, not six weeks before, the herbage seemed entirely parched up; vegetation had disappeared and the plain looked like a barren waste; but the sterile plain was now changed to a verdant field and myriads of gay flowers had started up out of the earth. Those who had seen this spot only in summer, would never suppose that a soil so arid and bare contained such an astonishing quantity and such a great variety of bulbous roots. Blossoms of every colour and every hue were at this time expanded to the genial warmth of the sun, and in such profusion that, from a little distance, some particular parts of the plain appeared as if painted red, others white, and others yellow. It is chiefly to the beautiful tribe of *Oxalis* that these enlivening effects are at this season attributable but not less so to two other extremely small and delicate plants (*Ixia minuta* and *Carpolyza spiralis* (*Strumaria Spiralis*)) which in countless multitudes whiten the soil."

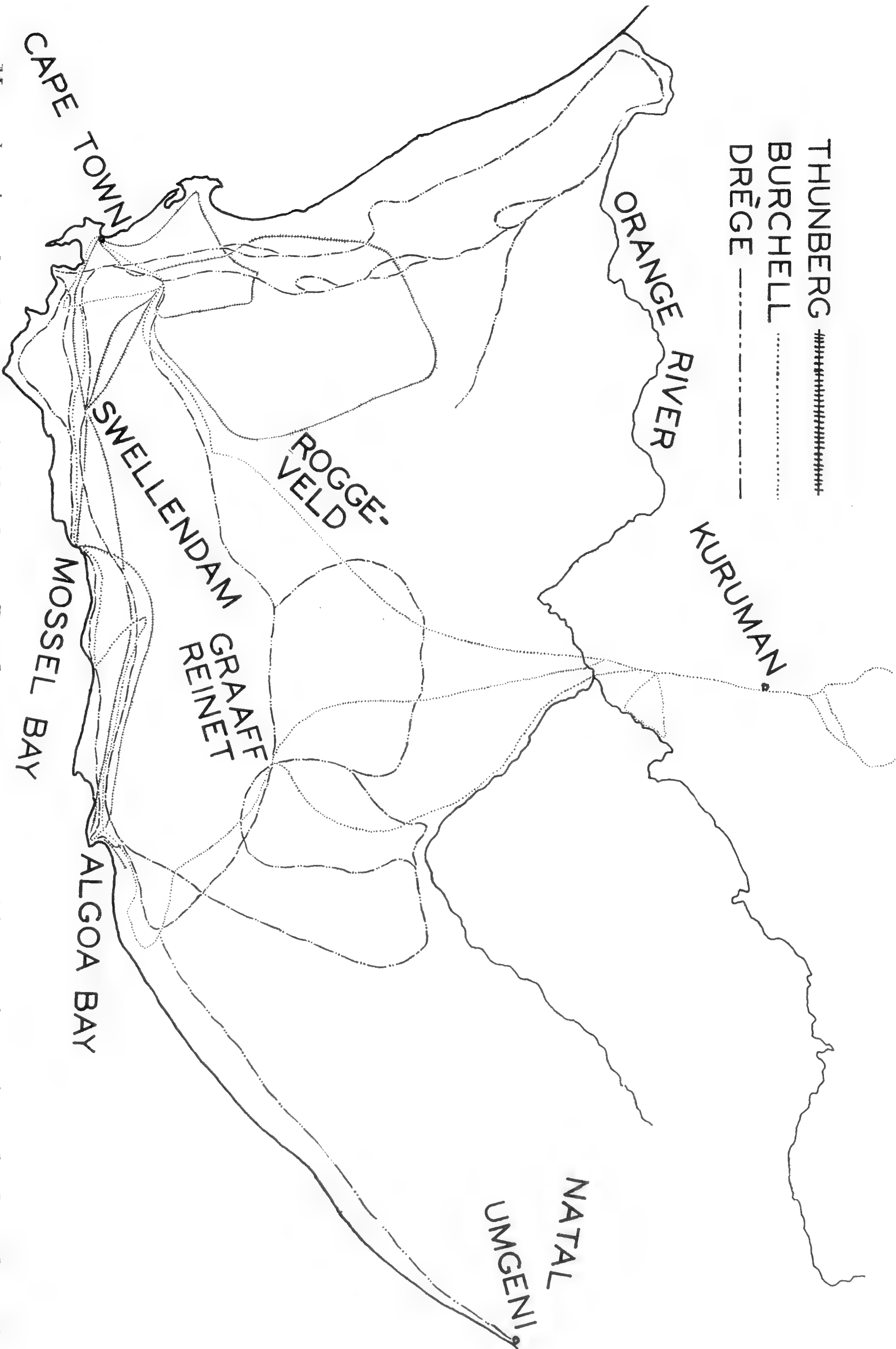
Even today although Green Point is in the midst of a populous suburban area it still exhibits these phenomena as far as the carpet vegetation is concerned. Most of the larger plants which could be plucked have dwindled and disappeared.

After Burchell came Ecklon and Zeyher and later Drège. These zealous and painstaking collectors were most aptly referred to by Professor MacOwan as "the lynx-eyed trio".

Charles Frederick Ecklon came to South Africa in 1822 as assistant to an apothecary. He was an ardent amateur botanist and after some years forsook his profession and attempted to make his living by selling collections of dried plants and other natural history specimens. He was joined in this venture by Karl Zeyher who had come to the Cape as a botanical collector in the same year as Ecklon. They made extensive journeys alone and together in search of rarities to send to Europe. Much could be written of their ups and downs—one of the collections which they sent to Europe was destroyed in a warehouse fire, another was lost in a shipwreck, and for many they received little or no recompense.

These men both died in extreme poverty in Cape Town but today many herbaria are greatly enriched by the specimens which they collected.

THUNBERG -#####-
BURCHELL
DRÈGE -----



Map showing the Journeys of Thunberg, Burchell and Drège. This map is not intended to show the exact routes taken but to give an idea of the extent of their travels.

In 1826 Johan Francis Drège arrived at the Cape. He ranks with Burchell as perhaps the most systematic and scientific collector of the early days of South African Botany. He collected in the South-Western parts of the Colony then later went inland and east as far as Graaff Reinet whence he returned by a more southerly route, via Albany, Uitenhage, the Langkloof and Swellendam to the Cape. He then undertook a journey into Namaqualand where he collected a vast amount of material including several *Gethyllis* and a *Crinum* on the banks of the Orange River—this was probably *Crinum longifolium*.

In 1831 Drège set out with Dr. Andrew Smith the Zoologist on an expedition to Delagoa Bay. Drège, however, went no further than Umgeni in Natal. From there he returned to Uitenhage and Albany, and later, travelled north through the districts of Queenstown and Aliwal North to the Orange River. Among the records of plants collected on this trip we find *Agapanthus*, *Tulbaghia*, *Brunsvigia*, *Strumaria*, *Cyrtanthus*, *Crinum* and *Haemanthus*.

Although not a collector or discoverer of amaryllids the name of William Henry Harvey cannot be omitted because of the stimulus given by his "Genera" to other botanists in the latter half of the nineteenth century. From 1835-1840 he held a position in the Treasury at the Cape and during this time he published the "Genera of South African Plants" and built up a large herbarium. In 1840 for health reasons he returned to his native Ireland and was made keeper of Trinity College Herbarium; later he became Professor of Botany at Trinity College and during this period, in collaboration with Dr. Wilhelm Sonder of Hamburg, he produced the first three volumes of the *Flora Capensis*.

After the publication of Harvey's "Genera" there came a group of men who were no longer merely collectors but who studied the botany of the country while they built up herbaria. These men were Bolus, MacOwan and Guthrie.

Harry Bolus came to South Africa in 1850 and the early period of his botanical activity was spent in and around Graaff Reinet and it was here that his friendship developed with Professor MacOwan who was then teaching at Somerset East. In 1874 Bolus came to Cape Town and joined his brother in business. The rich flora of the Cape at once claimed his interest and he began his special study of the orchids. He was actively engaged through all these years in building up his herbarium—the herbarium which today bears his name and is in the possession of the University of Cape Town.

His botanical excursions included journeys to Namaqualand, the Transvaal, Swaziland and as far afield as Delagoa Bay. He visited the eastern parts of the Colony, the Orange Free State and the Drakensberg Mountains. He collected many amaryllids—one of these, *Apodolirion Bolusii* was one of his early finds near Graaff Reinet. Practically all the South African genera of amaryllids are represented in the collections he made on these journeys, and in his systematic collection of the plants of the Cape Peninsula and its environs.

Contemporary with Bolus was Peter Macowan who came to South Africa as a school master in 1861. After teaching for a number of years, first at Grahamstown and then at Somerset East where he accumulated

an extensive herbarium, he was in 1881, appointed Director of the Cape Town Botanic Gardens and Curator of the Government Herbarium. MacOwan did not travel very much but he was the first to collect *Crinum MacOwani* in the Transkei and Griqualand East. This species is perhaps one of the most beautiful of our crinums and one which is frequently grown in gardens.

Among the professional collectors of this period was Rudolf Schlechter who came to the Cape about 1891. He travelled widely and collected many new plants as well as many which had not been seen since the days of the early travellers. He collected, *inter alia*, new species of *Cyrtanthus*, *Tulbaghia* and *Hessea*.

One of the first trained botanists to work on the South African flora was Dr. Rudolf Marloth (Plate 125)¹. By profession he was an analytical chemist but his magnificent work on "The Flora of South Africa" indicates the wealth of botanical knowledge which he possessed. He published a number of papers on the physiology and morphology of South African plants as well as much work of a taxonomic character. In a paper on *Gethyllis* which appeared just before his death in 1931 he described three new species and gave an account of the morphology of the peculiar epidermal structures which many members of this genus possess. Marloth was an ardent mountaineer and a keen photographer of plants in their native habitats.

Among the present day botanists in South Africa Dr. E. E. Galpin F. L. S. (Plate 124)² has perhaps made the most substantial contributions from the collector's point of view. He has also published several lists of the flora of regions in which he has collected. Dr. Galpin has enriched the South African herbaria, and more especially the National Herbarium at Pretoria, with thousands of specimens of the African Flora including many amaryllids. One of his recent discoveries was *Crinum crispum* Phillips (Flowering Plants of South Africa pl. 532, 1934). His name has been given to species of *Cyrtanthus* and *Tulbaghia* which he was the first to collect. Dr. Galpin is now 81 years of age, and is still collecting for herbaria.

There have been numerous other botanists and collectors in South Africa who have played important roles in bringing to light many rare and beautiful plants but it is impossible to detail them here. Many of them have their names perpetuated in the plants which they discovered and a glance at the list published elsewhere in this journal will reveal their names.

There is still a great deal of work to be done on the amaryllids of South Africa both in field and herbarium. There is not a genus without undescribed species—many of the specimens are incomplete since the flowers and leaves appear at different seasons and, in such a large and sparsely populated country, it is not always possible for the collector to return to a locality to complete his material.

¹The photograph reproduced in Plate 125 is the property of Raimund H. Marloth, the son of the late Dr. Rudolph Marloth.

²The photograph reproduced in this Plate is the property of the Bolus Herbarium, and was kindly lent by Mrs. Bolus, the Curator.

South Africa has provided many beautiful garden subjects and not least among these rank the amaryllids—*Nerine*, *Callicore*, *Vallota*, *Crinum* and *Agapanthus*. Some of these genera still hold surprises for the horticulturist—the less well known species of *Nerine* for example are not sufficiently appreciated in gardens. The day of the botanical explorer is almost over in South Africa although new species are still to be discovered off the beaten track; much, however, needs to be done on the taxonomy of the family and there is a rich field for the horticulturist to explore.

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WHAT SOUTH AFRICA IS DOING TO POPULARIZE ITS NATIVE SPECIES OF AMARYLLIDACEAE

E. P. PHILLIPS, *Chief Botanist,*
Division of Plant Industry.

Dept. of Agri. & Forestry, Union of So. Africa, Pretoria.

The American Amaryllis Society has opened a new vista and brought within the view of flower lovers the possibilities of species of *Amaryllidaceae* in horticulture. As far as South Africa is concerned, the Society has re-stimulated the interest in the family which was shown in the gardens of England and the Continent when species from the Cape first found their way to Europe at the end of the seventeenth and beginning of the eighteenth century and many of which were figured in the older botanical publications of the day. In South Africa a large area extending from the Cape, through the coastal districts to Natal and parts of the Transvaal lends itself to gardening and as a whole South Africans are keen gardeners. While that is so, only a very small percentage pay any attention to native species and in most private gardens one will only find the common orthodox garden plants from Europe in cultivation.

The Division of Plant Industry, Pretoria, through the publication "The Flowering Plants of South Africa" has attempted to make the native species of plants better known.

The tribe *Amarylleae* of the family *Amaryllidaceae* is represented in South Africa by sixteen genera and over one hundred and thirty species. Twelve genera and over fifty species have been described and figured in colour in the "Flowering Plants." It is the hope of the Division that through this channel the horticultural possibilities of the native species of Amaryllids may become more widely known in South Africa.



See page 26

Prof. R. H. Compton, upper left; Frances M. Leighton, upper right; Winsome F. Barker, lower left; L. B. Creasey, lower right.

BIOGRAPHICAL SKETCHES

This section, devoted to biographical sketches and portraits of contemporary South Africans interested in amaryllids, is not as complete as it ought to be. For various reasons part of the material did not arrive on time. In one case, L. B. Creasey (See Plate 127), only the photograph was received. We hope to include in 1940 Herbertia the missing biographical material.—Ed.

PROF. R. H. COMPTON—A BIOGRAPHICAL SKETCH

Robert Harold Compton was born at Tewkesbury, England, on 6th August 1886, and was educated at Mill Hill School and Cambridge University. He was a College and University prizeman, took first classes in both parts of the Natural Sciences Tripos, with distinction in Botany, and became a research fellow of Gonville and Caius College and a University demonstrator in Botany. His interests were mainly in morphology, and anatomy on which he published several papers. In 1913 he went on a plant collecting expedition to New Caledonia, and thereafter turned his attention chiefly to plant systematics. In 1919 he went to South Africa as one of the Professors of Botany in the University of Cape Town, an appointment carrying with it the Directorship of the National Botanic Gardens. He has held this post ever since, and has devoted himself, apart from teaching and taxonomic work on the South African flora, mainly to the administration and development of the Gardens at Kirstenbosch and Whitehill.

FRANCES M. LEIGHTON—A BIOGRAPHICAL SKETCH

Born in 1909 in King Williams Town, South Africa; obtained in 1929 the B. Sc. degree at Rhodes University College, Grahamstown; joined the staff of the Bolus Herbarium, University of Cape Town in 1931, and holds the position of third assistant; married Dr. William Edwyn Isaac, Plant Physiologist, Government Low Temperature Laboratory, Cape Town, in 1936; chief botanical interest lies in the taxonomy of the monocotyledons, especially the Genus *Ornithogalum* (*Liliaceae*) and *Agapanthus* (*Amaryllidaceae*).

WINSOME F. BARKER—A BIOGRAPHICAL SKETCH

Born in South Africa; educated at Rhodes University College, Grahamstown; obtained the B. Sc. degree; joined staff of National Botanic Gardens, Kirstenbosch, as holder of the Edward Muspratt Solly Scholarship for 1929 and 1930; from 1931-July 1933, while stationed at Kirstenbosch, was employed by the Royal Botanic Gardens, Kew, making collections of herbarium specimens and living plants; was appointed Botanical Assistant at Kirstenbosch in 1933; chief botanical interest lies in the taxonomy of the petaloid monocotyledons, especially in *Nerine* and *Hessea*.

HERBERT MEDALISTS—1939

With the award of the Herbert Medal to five outstanding workers in the field of the *Amaryllidaceae* in 1939, the stage has been reached when over-due honors have been more or less taken care of, and in the future *not more than one* Herbert Medal will be awarded each year.

The class of 1939 is as illustrious as the preceding classes including the names Hutchinson (phylogeny of amaryllids), Stout (daylily breeding), Lancaster (origination of *Cooperanthes*), Purdy (introduction of *Brodiaea*, and *Allium* species), and Howard (origination of *Crinodonna Howardii* and hybrid amaryllis).

DR. J. HUTCHINSON—A BIOGRAPHICAL SKETCH

He was born on January 20th, 1884, and lived for the first twenty years of his life in his native county of Northumberland. There he attended schools and developed his early interest in Botany, winning distinction in the subject at school. For six years after leaving school he received his training in practical horticulture in gardens in Northumberland and came to Kew as a Student Gardener in 1904. His interest in the scientific side of horticulture was quickly recognized and he was selected to fill the post of Temporary Technical Assistant in the Herbarium the following year, a post he held until 1907 when he was promoted to be Assistant for India. This post he filled for two years and in 1909 he was appointed to the newly-created post of Assistant for Tropical Africa, a post he held with distinction from 1909 to 1915. He then reverted to Indian Botany and held the post of Assistant for India a second time from 1915 to 1919, relinquishing it on his appointment as a Botanist in the Herbarium on the permanent staff of the Royal Botanic Gardens, Kew. This appointment he held from July 1919 until April 1936, and during this time he devoted his studies to the African flora and also wrote his well-known books. It was during this period that he paid two collecting visits to South Africa.

His work on the South African flora and his contributions to Systematic Botany were very fittingly recognized by the University of St. Andrews, Scotland, when the Honorary Degree of Doctor of Laws was conferred upon him on the same day (Oct. 17, 1934) that General the Right Hon. J. C. Smuts, F. R. S., was installed Rector of the University. On this occasion the Dean of the Faculty of Arts gave the following oration:—

“Mr. Hutchinson, whose career is itself a tribute to the system of promotion that prevails at Kew, is a Botanist whose detailed work on the Families of Flowering Plants marks the end of an old, and the opening of a new chapter in British systematic botany. Four years after he entered the Kew Herbarium he became Assistant for Tropical Africa, and his devotion to African botany was pledged. Twice at the invitation of the Government he visited and explored the country and on these journeys had with him as fellow traveller and collector a South African systematic botanist of no mean order—the Rector of St. Andrews, i. e., General Smuts! On the moun-



Vandyk, London

See page 29

Dr. John Hutchinson—Herbert Medalist, 1939

Plate 128

tains at the southern end of Tanganyika they were fortunate to find a new species—(*Pteronia Smutsii* Hutch.)—of a genus known formerly only farther south; and one of them gave to it the other's name. We congratulate them both to-day on adding simultaneously to their vasculums a northern specimen, which, if not exactly rare, for it is something of a hardy annual now, is still coveted by many, and not easy yet to come by—the *Doctoratus Andreensis utriusque legis.*''

Hutchinson is now Keeper of the Museums at Kew, having been promoted to that important office on 1st April, 1936.

Arthur W. Hill
Director

Royal Botanic Gardens,
Kew, Surrey,
2nd. March, 1939.

EDITORIAL NOTE

While in Europe last summer and fall, the writer had the great pleasure of meeting Dr. Hutchinson personally, and he was impressed by his charming personality (Plate 128) and keen intellect. We are all exceedingly grateful to him for his forward-looking scientific approach to the science of plant phylogeny. His system of plant classification has a number of important features, but one is of particular immediate value to us. The former, more or less, complicated grouping (poly-phyletic in many cases) on the basis of more or less artificial characters, has been broken up into smaller but more natural and homogeneous families. The value of such an approach to both the scientist and amateur is at once evident for these simpler units can be more easily understood, and the system therefore becomes a tool for inspiration and progress.

Hutchinson's system has been criticized by some on the basis that it would mean too much work to reclassify the herbarium specimens under their care. The scientist attempts to come ever closer to the truth, and Dr. Hutchinson certainly never intended that it should be used as a guide for filing herbarium specimens at this stage for it is a scientific treatise meant for research workers in plant taxonomy who are interested in working with phylogenetic entities. He knows that there is a distinct difference between the science of phylogeny that is *never* static and *ever* dynamic, and the system of filing specimens where *stability* is desirable. The physicist and chemist, for instance, do not ignore progress in their respective fields because it would necessitate the rewriting of their texts. Why should it be otherwise in the field of Taxonomy? One might suggest, to the taxonomist who is so concerned about his dried specimens, that he keep his present system of classification indefinitely for purposes of filing, or he might file his specimens alphabetically and so have a system that will never be out of date, for progress in the science of phylogeny, when new facts are uncovered, may mean changes in any natural system of plant classification. With no further axe to grind,

he will no longer be an incubus to progress by resenting changes as science develops.

Dr. Hutchinson's work has been particularly inspiring to the members of the Society in spite of the fact that he has pruned whole branches from the family tree. Although the field covered has been narrowed, we have the satisfaction of knowing that we are working with a more homogeneous Amaryllis Family. The award of the Herbert Medal to Dr. Hutchinson is especially appropriate since his grouping of the amaryllids is really the first great advance in the understanding of the Family since the publication of Herbert's Amaryllidaceae in 1837.

Hamilton P. Traub

*Mira Flores,
Orlando, Fla.,
July 4, 1939*

ARLOW BURDETTE STOUT

An Autobiography

The writer of an autobiography may ignore the period of childhood and youth but he must know that it is a most important segment of a life, and who can remember and evaluate its experiences better than he?

I cherish many memories of home, school and social life in the humble and wholesome setting of the rural community at Albion, Wisconsin. At an early age there were chores for me; then came light labor in the care of a vegetable garden, and my mother was one of the best of gardeners; and later there were long days of hard work on the farm. But in that community honest labor was dignified; it brought not only the necessities but the pleasures of life; it was the privilege of everyone except unfortunates.

At that time at least three-fourths of the region about our home was uncultivated. There was a mosaic of virgin areas of prairie, lowland meadows, swamps and woodlands of several types. There were meandering creeks, larger streams to the size of Rock River and ponds and lakes, the largest of which was Lake Koshkonong. Plants and animals were diverse and abundant. To me it was a fairyland and almost every spare hour and day in all seasons throughout the years from the age of 10, I spent afield. I hunted, fished and trapped; I spent much time in learning by direct observation as much as possible about the plants, animals (especially birds), rocks, fossils and Indian mounds of the area.

EARLY EDUCATION

School was somewhat serious and interesting, but scarcely strenuous. There was a one-room country school house and there were about forty pupils of ages from six to eighteen. For the older pupils from the farms, attendance was decidedly intermittent and mostly confined to the winter months. A dictionary was the sole volume for reference and supplementary reading. Few of the younger children wore shoes

or boots except during cold weather. There was a tin pail for drinking water and one dipper for all. No one was graduated. Some "finished" school when the fifth reader and the advanced arithmetic was "learned" from cover to cover.

The early settlers in Albion brought from the East a keen interest in education and they soon established Albion Academy which flourished for several years. But this school had closed and its three large buildings on a spacious campus stood empty and forlorn at the time when my generation was leaving country school. Two different attempts were made to reestablish the school and during these periods I was able to have three terms of study. In the first of these, when I was 16, I had for a teacher in physical geography, the naturalist and ornithologist, Ludwig Kumlein. To me he was a most inspiring teacher, and the first to present a natural science to my ken. His descriptions of the character of the earth's surface and particularly of the polar regions which he had helped to explore, his discussion of Ferrell's Law in relation to ocean currents and to air currents, and his explanation of the agents of surface erosion presented to me a never-to-be-forgotten mental picture of the dynamic earth on which we live. Also he answered outside of the classroom many of my inquiries about plants and birds. Two years later he was a Professor of Natural Sciences at Milton College and I went there for the winter term, chiefly to enroll in classes which he taught. I was not admitted to the course in zoology which was considered an advance course, but I was allowed to join the class in physics and thus had my first introduction to the experimental method of study and demonstration.

In 1895-1896 I was a student in Albion Academy which had been reorganized under the leadership of Professor Peter Hendrickson. Now for the first time I studied botany as a class room subject. The text book was "HOW PLANTS GROW" by Asa Gray. The chapters on the gross structure of flowering plants were followed closely and the class was taught how to use the key to "Popular Flora". The instruction did much to organize my knowledge of plants in the field. Somehow I was most impressed with the description of the processes of seed reproduction. The text on this point reads as follows:

"The use of the pollen is to lodge on the stigma of the pistil, where it grows in a peculiar way, its inner coat projecting a slender thread which sinks into the pistil, somewhat as a root grows down into the ground, and reaches an ovule in the ovary, causing it in some unknown way to develop an embryo, and thereby become a seed". . . . "After the flower comes the fruit. The ovary of the flower becomes the seed-vessel (or pericarp) in the fruit. The ovules are now seeds".

But during the following summer I was both surprised and perplexed to observe that the two plants of our flower garden that had the most conspicuous flowers did *not* produce capsules and seeds. At one end of the porch there was a cluster of plants of the old familiar fulvous daylily (*Hemerocallis fulva* clone EUROPA) and at the other end

there was a colony of the tiger lily (*Lilium tigrinum*). The numerous flowers were perfect but *after the flowers the fruit did not come*. My curiosity regarding this condition has remained through the years that have followed. When I came to The New York Botanical Garden plants of these two clones were obtained for experimental study and soon thereafter my interests became centered in the processes of reproduction in flowering plants with special reference to the conditions of sterility.

TEACHING IN RURAL SCHOOLS

During the autumn of 1895 I met with what seemed at the time a dire misfortune. While playing football the tendons of one knee were so badly torn that for weeks at a time I could get about only with the aid of a crutch or cane. When the spring of 1896 came I was unable to work on the farm. I could earn nothing and it was a period of hard times. I was twenty years old. For the first time I was forced to consider the value of physical well-being and its uncertainties. I faced despair. Something had to be done and so for about six weeks I gave the injured knee complete rest with the home treatments advised by the family physician. And during that time I memorized the contents of text books on those subjects which were included in the examinations for a teacher's certificate. I actually learned the Constitution of the United States from beginning to end. Luckily for me I obtained a "third grade certificate" and also an appointment as teacher of a country school at the wage of \$25.00 per month.

For two happy busy years (for me at least) I was teacher in a modest little country school house with an attendance of about 35 pupils. The knee improved and crutches were discarded. I saved \$300.00 which were on deposit in a bank and I planned to enter the State Normal School at Whitewater, Wisconsin in the autumn of 1898. But before that time arrived the bank failed due to the defalcation of the cashier who fled to Canada and there lived in immunity. Ultimately I obtained about \$30.00 of my bank savings. I went to the Normal School with less than \$50.00 at my command and I completed the elementary course of two years of study without receiving a cent from anyone except as I earned it.

During the school year of 1900-1901 I taught in the one-room district school of my home village of Albion. The wages were \$50.00 a month. There were about sixty pupils of all ages from six to sixteen. During the year the inadequacies of this one-room school were discussed with pupils and parents and at the following school meeting a graded school of two rooms was provided for.

STUDIES AT THE WHITEWATER STATE NORMAL SCHOOL

Then two more years were spent at the State Normal School at Whitewater where I was graduated from the advanced course in June 1903. It is indeed proper that I pay special tribute to the sterling character of the faculty of this School and to the able leadership of President Albert Salisbury. The more elementary subjects were covered in 10-

week or 20-week courses. Attention was given to methods of education and to actual practice teaching. The last two years of the curriculum covered a well-balanced schedule comprising sciences, mathematics, literature, languages, history and education. Especially did I appreciate the courses in human physiology, zoology and botany taught by Professor W. S. Watson who possessed both a rare skill as a teacher and a comprehensive knowledge of these subjects.

I had managed to take the advanced course in botany during 1900. The chief texts used were "LABORATORY MANUAL OF BOTANY" by Clark and "ELEMENTARY BOTANY" by Atkinson, both of which were editions of 1898. There were various other volumes for reference. In this course I obtained an entirely new conception of living plants and of the processes of their reproduction in the treatments (1) of protoplasm, (2) of physiological processes, (3) of comparative morphology, especially in respect to life histories in relation to reproduction, (4) of chromosomes in cell-duplication, fertilization, and reduction divisions, and (5) of ecology, especially in respect to pollination. The use of a microscope and its revelations interested me to the point that approached fascination.

My copies of the two texts mentioned above have remained among the few choice volumes of frequent reference in my "working book shelf." It still seems to me that no text of the size of this "ELEMENTARY BOTANY" equals it in comprehensive scope and clearness of presentation. I confess that there were times when I wondered what advanced botany could be like if this volume is merely "elementary."

During my last year of study at the Whitewater State Normal School I attempted to identify all the species of plants which grew on the grounds of the school. Part of this area was an arboretum but there was a virgin area of nearly five acres of a drumlin on which grew a diversity of native wild flora. The list of these plants was edited and revised by Professor W. S. Watson and published as "A Hand-book of the Arboretum of the Whitewater Normal School and the Flora Inhabiting its Grounds" (Bulletin of the State Normal School 5: No. 3. 1908). For use in this study I had the 6th edition of the "MANUAL OF BOTANY" and "FIELD, FOREST AND GARDEN BOTANY" by Asa Gray, and the three volumes of the then recently published "ILLUSTRATED FLORA" by Britton and Brown.

TEACHING SCIENCE IN THE HIGH SCHOOL AT BARABOO, WISCONSIN

From September 1903 until June 1907 I was a teacher of science in the High School at Baraboo, Wisconsin and during the last year I was principal. About 60 pupils were enrolled each year in botany. There were laboratory exercises with the use of microscopes for demonstration. There was some study of bacteria. A few representative species of algae, fungi, liverworts and ferns were collected in the immediate locality and studied; but about half of the time was devoted to flowering plants. The text book which was used was "FOUNDATIONS OF BOTANY" by Bergen. The definition of botany which was printed in the introduction

to this volume and credited to Professor George L. Goodale is as follows:—"Botany is the science which endeavors to answer every reasonable question about plants." In our effort to meet the more popular questions about plants a special table was set aside in the laboratory for the display of plants and plant materials and the attempt was made to name for this display any plant of which material was brought by any person, student or otherwise. It was necessary for me to send some of the specimens, especially of the fungi, to the University of Wisconsin or to the Public Museum in Milwaukee for identification. My first association with Professor R. A. Harper was in this relation.

MY FIRST PAPER ON BOTANY

The first of my published papers on botany appeared in 1905 (More About Canvas-Back Food, Northwestern Sportsman). This reported observations on the formation of tubers or fleshy buds by plants of *Potamogeton pectinatus* which grows in abundance in the shallow waters of Lake Koshkonong. The naturalist, H. L. Skavlem, had previously discovered and reported that the tubers of this species provide an important food for ducks, especially the Canvas Back, which then frequented this Lake in great numbers during the spring and autumn migrations. For some two weeks in August 1904 I was a guest of Mr. and Mrs. Skavlem at their summer home at Carcajou Point, Lake Koshkonong, and this period was spent in studies on the plants which provide food for wild ducks. Without consulting me, Mr. Skavlem published under my name the notes which were recorded of our observations. For a number of years thereafter I made studies and collections of all species of *Potamogeton* which I could find in the areas that I frequented.

INTERESTS IN ORNITHOLOGY

For 15 years I assiduously studied bird life in the wild and during a considerable part of this time I held a permit issued by the proper authorities of the State of Wisconsin which made it legal for me to collect at any season both birds and their eggs for "scientific purposes." I accumulated a collection of bird-skins for record and study. My main guidance in these studies was a volume of the fourth edition of the "KEY TO NORTH AMERICAN BIRDS" by Elliott Coues. This book cost \$7.50 and I recall that the sum expended for it came from the sale of raw furs of mink, muskrat and skunk which I had trapped. I also made some progress in the art of taxidermy (for birds and small mammals). I still possess my well-worn volume on "TAXIDERMY" by William T. Horniday, which I purchased soon after the edition was published in 1893. Frequently handy cash came to my pocket in payment for mounting ducks, owls, hawks and other birds for hunters and also pet canaries that had died of old age.

But my last serious endeavor in ornithology was during the early summer of 1904 when I invited Alexander Wetmore, who had been a stu-



Dr. A. B. Stout—Herbert Medalist, 1939

dent during the previous year in the Baraboo High School, to spend two weeks with me at Lake Koshkonong. At that time his interests in ornithology were already keen and his knowledge of bird life in the area about Baraboo and North Freedom was very complete. I believe that this was his first collecting trip at some distance from his home and his first opportunity to study the bird life of a large lake. Dr. Alexander Wetmore is now internationally known for his noteworthy contributions to the science of ornithology.

INTERESTS IN ARCHEOLOGY

Week-ends and portions of my vacations throughout the four years of teaching at Baraboo were spent out-of-doors in the area about Baraboo, in which there was, and still is, much of interest in ornithology, botany, geology and Indian archeology. A descriptive survey of the archeology of eastern Sauk County was undertaken and this was published in 1906 (*The Wisconsin Archeologist* 5: No. 2). In this area there is a remarkable earthen effigy of the human figure, 214 feet in length, and the only one of its kind in existence. It seemed to me obvious that this effigy mound should be preserved from destruction. The cooperation of those who made this possible is a matter of record.

During my vacation in the summer of 1906 several weeks were spent at Lake Koshkonong in making, with the collaboration of H. L. Skavlem, a survey of the archeological features about this lake. This was published in 1908. Mr. Skavlem was then a naturalist and ornithologist of extensive knowledge and unusual ability. Later he became skilled in manufacturing arrow-heads and other stone artifacts such as had been made by the Indians.

My surveys of Indian mounds in Sauk County, at Lake Koshkonong and later about Madison were purely avocational. But in each of the summers of 1908 and 1909 I spent about six weeks in the employ of the North Dakota Historical Society under the general direction of Professor O. G. Libby in making surveys of the old village sites of the Mandan, Arikara, and Hidatsa Indians.

AT THE UNIVERSITY OF WISCONSIN

In the autumn of 1907 I was matriculated in the University of Wisconsin, where I had already been enrolled as a student during two summer sessions. Botany was elected my major subject and Professor R. A. Harper was my adviser. There were courses on the morphology of the fungi, the algae, the mosses and liverworts, the ferns and the flowering plants, on physiology, on cytology, on hybridization, on heredity, and on the special subjects of the seminars. Courses of study were taken in chemistry, soils, bacteriology and plant pathology. During the year 1908-'09 I was assistant in botany. In June 1909, I received the degree of B. A. and I was one of those chosen for Phi Beta Kappa and a year later I was elected to Sigma Xi.

DECISION REGARDING A VOCATION

In June of this year (1909) Zelda Judd Howe and I were married and we began our home-keeping at Madison. We had been friends since our youth. Soon it was necessary to decide on one of four opportunities which arose for a vocation. One was as teacher of biology in a State Normal School; one was in agricultural work at the State Agricultural Experiment Station; one was a position as state archeologist in a nearby state; and one was the opportunity to remain at the University as instructor in botany with some time for studies and research under the guidance of Professor R. A. Harper. The decision to undertake the work last named, which carried the least salary, was urged by Mrs. Stout. Because of this and of her continued sympathetic accord to my interests and work it can be said that since the autumn of 1909 some aspect of botanical endeavor has been our vocation. The earlier activities in ornithology and in archeology provide many pleasant memories and add much to the more incidental and avocational interests and interludes.

AT THE NEW YORK BOTANICAL GARDEN

In the autumn of 1911, Professor R. A. Harper became Torrey Professor of Botany and Head of the Department of Botany in Columbia University and at the same time I was appointed Director of Laboratories in The New York Botanical Garden, which is affiliated with Columbia University. In February 1913, the degree of Ph. D. was granted to me by Columbia University. I have remained at The New York Botanical Garden and in January 1938, I was asked to take charge, for a time, of various of the educational activities and public relations and in accord with this my official title was changed to "Curator of Education and Laboratories."

During the past twenty-eight years of my tenure at The New York Botanical Garden most of my time has been devoted to research. Especially during the earlier years I had the advice of Professor R. A. Harper and of Professor N. L. Britton, who was Director-in-Chief of The New York Botanical Garden, and to them I owe much. My interests and research have centered in the processes of seed reproduction in flowering plants and especially in the limitations or "sterilities" in such reproduction. Various plants have been involved in these studies. There have been (1) direct observations, as of the flower behavior of avocados, (2) experimental studies, especially in regard to the behavior, the scope, and the heredity of incompatibilities, (3) cytological studies, especially in *Lilium* and *Hemerocallis*, (4) hybridization and selective breeding for the development of new types of value in horticulture, and (5) the application of the results of various of the studies to genetics and to practical problems in plant breeding and in the production of fruit. Some of the special lines of study may be mentioned.

For the academic year 1921-'22, I was a visiting member of the faculty of Pomona College in Southern California. During this time studies were made on the viability of date pollen in cooperation with Dr. Walter T. Swingle of the United States Bureau of Plant Industry.

Also a special interest developed in regard to the irregular fruiting and non-fruiting of avocados and the studies which were made of the flower behavior revealed the synchronous and reciprocating nature of dichogamy in these plants. Later (1925 and 1932) two periods of further research on this condition and on its relation to fruit production were spent in Florida.

Research on seedless grapes has been a major project since 1919, and this has been conducted in cooperation with the Department of Pomology of the New York State Experiment Station at Geneva, New York. This research involves (1) a study of the nature of the types of seedlessness (parthenocarpy and stenospermocarpy) in grapes. (2) breeding for the development of hardy seedless grapes, and (3) a study of the heredity of seedlessness. At the present time more than 200 different seedlings which bear seedless or near-seedless berries have been obtained. The most promising of these are being tested for possible vineyard culture.

During the seven years from April 1924 to July 1931, I planned, directed and participated in an extensive program of hybridization in the genus *Populus*. This was done for the Oxford Paper Company in connection with plans for reforestation in the production of pulp wood. Dr. E. J. Schreiner, then a student in the College of Forestry of Syracuse University, was employed by the Company for this research and I am pleased to speak of his ability, keen interests in the problems involved and splendid spirit of cooperation. We are pleased to note and recognize the support given to this project by Professor Ralph McKee who was for a time director of research for the Oxford Paper Company and whose interest in this project was largely responsible for its inception. The studies of the large number of hybrid poplars obtained in this breeding effort have been combined with other projects of tree breeding under the auspices of the U. S. Forest Service and with Dr. Schreiner in immediate charge. I have the pleasure of collaborating in this research.

Studies of the sterilities of cultivated potatoes were made over a period of several years, and during the years 1921-1924 inclusive several weeks were spent each summer at Presque Isle, Maine, in cooperation with Dr. C. F. Clark of the U. S. Bureau of Plant Industry in a special and rather extensive survey of pollen viability in numerous clonal varieties, seedlings, and wild species (See Department Bulletin 1195, U. S. D. A.)

To various readers of HERBERTIA my researches on daylilies (*Hemerocallis*) will be of special interest. The complete failure year after year of the old fulvous daylily (clone EUROPA) and of the tiger lily (*Lilium tigrinum*, clone INTERMEDIATE) to produce capsules and seed attracted my attention during my youth and has continued to be of interest to me ever since. Observations on the results of self- and close-pollination of plants of the EUROPA DAYLILY began during my first year at The New York Botanical Garden. Plants of this clone were obtained from various localities in United States and from other countries. Other species of *Hemerocallis* were soon included in the studies. By 1919 (Jour. N. Y. Bot. Garden 20: 104-105) seeds had been obtained from

several hybridizations and several thousand controlled pollinations had been made for flowers of daylilies. It was soon decided that the sterility of various daylilies and of lilies which are propagated vegetatively as clones is due to "incompatibilities" and not to "correlative sterility."

Hybrid daylilies in considerable number were blooming in 1923 and various persons who saw them advised that they be distributed for garden culture. In 1924 Dr. N. L. Britton, Director of The New York Botanical Garden, considered this matter quite fully and decided that the Garden can not propagate daylilies either for general distribution or for sale and that cooperation with some one reputable nursery firm should be obtained for the introduction of the new selections. Various nurserymen in the vicinity of New York City, some of whom had favored the Garden with contributions of plants, were approached but not one of them was willing to cooperate in testing and propagating the most promising seedlings of these daylilies.

Letters were then written to more remote nurserymen but the only response came from Bertrand H. Farr, who soon came to inspect the new seedlings. He offered to cooperate in introducing them to the trade. After his death in the following autumn the nursery company which he had established continued in the cooperation, the fundamental aims of which are (1) to evaluate selections critically, (2) to propagate the selected seedlings during the period of trial and evaluation, and (3) to make the best of the selections available to a considerable number of persons at the same time and at a relatively low price.

The scope of my investigations with *Hemerocallis* include several main objectives:—(1) There is the taxonomic treatment of the genus which involves a critical study of numerous wild plants from various parts of the Orient. The text and twenty-four colored plates are now in the final stages of preparation for a folio monograph of the genus. (2) The extent to which inter-specific hybridizations are possible is being determined and studies are made of the character of the hybrid offspring in regard to the heredity of specific characters and to sterility and fertility. (3) Selective breeding after hybridization is being tested and its possibilities determined in respect to the extent and the degree to which characters may be modified for the development of distinctly new types of horticultural daylilies. (4) Studies of the comparative cytology of all species and of various hybrids are in progress with reference to specificity, to structural sterilities, to heredity and to polyploidy. (5) Much study is directed to the phenomena of self- and cross-incompatibilities within the different species. (6) The selection of seedlings of distinct character for garden culture is a feature to which critical attention is given but this is rather incidental and secondary to the scientific and botanical studies.

AFFILIATIONS

I have been favored with an Honorary Life Membership by The Horticultural Society of New York and by The Pennsylvania Horticultural Society. In February, 1935, I was elected an Honorary Life

Fellow in The Royal Horticultural Society. Other affiliations with scientific organizations are as follows: American Amaryllis Society; Fellow, American Association for the Advancement of Science; American Society of Naturalists; Botanical Society of America; Honorary Life Member, Ohio State Historical and Archeological Society; Torrey Botanical Club; Honorary Life Member, Wisconsin Archeological Society; Wisconsin Academy of Arts and Sciences. In 1937 I received the Thomas Roland Medal of The Massachusetts Horticultural Society. An exhibit of seedling daylilies was awarded a gold medal in June 1938 by The Horticultural Society of New York.

This autobiographical sketch would never have been written had something of its nature not been required in connection with the award of the William Herbert Medal by the American Amaryllis Society.

AN APPRAISAL?

During a recent visit with relatives in the village of my boyhood days, a young cousin of a later generation asked me to explain what my work is. My attempt to answer in non-technical terms brought the comment "Well that seems more like the pursuit of a hobby than real work." I confess that my efforts in botany throughout a half century of first hobby and then vocation have never seemed to me to be work that is toil or labor. And I am certain that this may also be said for the botanists and horticulturists whom I have known most intimately.

SYDNEY PERCY LANCASTER

AN AUTOBIOGRAPHY

My father, a banker by profession, was also a keen gardener and when he was manager of a local Bank in Lucknow was well known as a grower of lilies. His experiments in cross breeding were entered in a note book and show that his first hybrids of Amaryllis were raised in 1890, and of Canna in 1896, at the time of his death the Society had a collection of 390 Amaryllis, more than half being seedlings he had himself raised.

In 1892 my father was appointed Secretary to the Agricultural & Horticultural Society of India, Calcutta, which had its Garden at Alipur. Being an only son I spent my holidays pottering about the Society's Garden and to keep me out of mischief, father gave me a small plot of land to call all my own. I had seen him pollinating Canna so tried my prentice hands and at the age of twelve obtained, among my seedlings, a deep yellow variety which my father took over. I was rather resentful that my "ewe lamb" had been absorbed into the Society's collection and it was not till later that I appreciated the compliment. This was in 1898. As I was fond of gardening father decided to put me through the rudiments of the trade before sending me to England and the Continent to finish my training, and in November 1902, I was entered as the Society's first apprentice. The following November father took ill and died in



Sydney Percy Lancaster—Herbert Medalist, 1939

February 1904, leaving me to support a mother and three sisters. With the appointment of a new Secretary I was promoted to Assistant Secretary and succeeded to the Secretaryship in October 1914.

The Agricultural and Horticultural Society of India was founded in 1820 by the Baptist Missionary, Revd. William Carey, chiefly to improve the Cereals, fruits and vegetables of the country, by the introduction of imported seeds and plants, with horticulture as a secondary theme. Literature dealing with Indian Agriculture will show that the Society did its work with credit but in 1920 the Viceroy of India, Lord Curzon, placed all agricultural work in the hands of a Government Department and this relieved us of the burden. I might add that the Society is not supported by contributions or donations but depends on members who, in exchange for an annual subscription, receive a very generous return in plants and seeds, etc. The Garden in Alipur is only 23 acres in extent, part is utilised as a Public Park and the rest as a nursery so that very little space can be utilised for testing grounds. The term Secretary embraces Superintendent of the Garden as well and in my dual capacity I have little time for experimental work; with a membership of a little more than a thousand I spend hours at my desk offering them help and advice. This accounts for the small return I can show for the years of work given to gardening.

Cannas have always been my first love and since 1904, I have added many new and improved varieties to the Society's collection and the selection stands second to none in India and perhaps in the world. Cooperanthes came into being in 1909 and were the result of an attempt to obtain coloured Cooperias. These lilies are not appreciated in this country as the period of beauty is short lived and we have a voracious caterpillar, black spotted with scarlet and white, that eats down not only the leaves but delves into the heart of the bulb. (See Herbertia Vol. 3, page 108) A selection of Cooperanthes is being grown by the American Amaryllis Society and these bigeneric hybrids can be judged on the spot. Amaryllis (Hippeastrum) do not succeed in Calcutta for the damp humid climate brings about rot in two to three years and only the hardiest types survive. Of those raised by my father none remain, the white and pale shades dying out first. *Amaryllis belladonna* (*H. equestre*) and *A. stylosa* flourish and I am now using these two as the parents of a hardy race. In 1932 an out of season *Amaryllis stylosa* flowered and I was able to obtain a cross between this and *A. reticulata*, var. *striatifolia* and most of the seedlings have now flowered and three are worth retaining. (See Herbertia Vol. 3, page 97)

After my father's death a seedling *Crinum* flowered in 1905 which I named *Lancasteri*. I could find no mention of the parentage and it was quite distinct from any I had seen, the foliage being shiny and the colour of the flowers several shades paler than *Ellen Bosanquet*. Unfortunately the bulbs do not increase rapidly and I have only two small offsets. I made a number of crosses in subsequent years between the many varieties in our collection but few set to seed and as the flowers of *Crinum* are mostly night opening they are not popular with amateurs in this country. Since 1932 I have been using *C. americanum* as seed

parent and there are quite a number of distinct seedlings now being tested. *Hedychium*, the Butterfly Lily, has given me many new types, large and small flowered. I commenced crossing this Canna-like plant in 1913 and in four years built up an excellent collection which died out one year when we had drought and were compelled to use brackish water for our plants. A further series of hybrids is now in existence and specimens have been sent to Kew and distributed to keen amateurs in more suitable climates. These plants flower during the wet months of the year. *Hemerocallis* hybrids are a new venture and the slight variation in shade and shape I have obtained is not worth mentioning.

Here are a few other lines of plants that I have succeeded with. Shrubs—My first successes with *Hibiscus* and *Ixora* are recorded in 1907, *Lagerstroemia* in 1908, *Dombeya* in 1909, *Plumeria* in 1908, *Barleria* in 1912, *Dracaena* in 1909, *Crotons* 1912, and *Bauhinia* 1912. In climbers I first obtained a hybrid of *Antigonon* in 1904, and *Bougainvillea* in 1931. Many herbs and succulents such as *Ruellia*, *Anthurium*, *Begonia Rex*, etc, have been kind and given results for my attempts. In 1929, I raised my first hybrid *Cosmos*, *Alipur Beauty*, and have since worked on a new range of colours and forms. Bodgers have very kindly undertaken to breed true some of the forms and introduced them. *Tithonia speciosa* crossed with the perennial yellow *T. tagetiflora* gave me distinct shades in 1930. A range of *Hibiscus cannabinus* hybrids were raised in 1934. I have also a number of colour variations of the perennial *Verbena erinioides*. These are the result of crosses with the annual varieties, but the majority being sterile, can only be propagated vegetatively.

Attempts that have failed are legion and promising seedlings destroyed by accident or carelessness too many to enumerate. The actual operation of cross breeding is simple enough (except in the case of the *Compositae*), it is the long years of waiting before the seedling flowers and the various elements that conspire and combine to cause loss that is so disappointing.

CARL PURDY—AN AUTOBIOGRAPHICAL SKETCH

Carl Purdy was born in Dansville, Michigan on March 16, 1861. When he was still a child he crossed the Great Plains with his parents in an emigrant (covered) wagon in 1865. After living in Virginia City, Nevada for a few years, the Purdy family took up residence in Reno. At the age of nine years, in 1870, he moved to Ukiah, California, and has maintained a residence there ever since although he absented himself for varying periods before 1888.

At the age of seventeen he began commercial bulb collecting, and this later became his life's work. He became intensely interested in botany, particularly systematic botany, and devoted a large part of his time to it.

He taught school from 1879 to 1886, and during the next two years he was employed by the Wells Fargo Express Company, and was also a fire insurance agent.



Carl Purdy—Herbert Medalist, 1939

In 1888, his bulb business had become large enough to warrant making it his life's work. During his career, he laid out and maintained several gardens, the last one at his home, "The Terraces," is now 37 years old. It is located in a lovely natural setting high in the mountains east of Ukiah.

Mr. Purdy's botanical work has at all times had close connections with his garden, and in this way he specialized in one plant genus after another. He has published monographs on *Calochortus*, *Lilium* (of W. N. Amer.), *Erythronium*, *Brodiaea*, *Fritillaria*, and the minor *Liliaceae* of Western North America. He has lectured widely and has written much on plants during the past sixty years as the spirit moved him with little thought of the matter after it was written other than his major works. For a long time he had no library facilities and even now these are not ideal.

In 1903 Mr. Purdy began work as a landscape gardener and this has been quite a large part of his life ever after. Since that date he has laid out many estates in Northern California as well as wild flower gardens for which he is especially qualified on account of his wide experience in growing wild flowers.

Among the plants, named by Mr. Purdy, are *Lilium Kelloggii*, *L. occidentale*, *Calochortus vesta*, *C. amabile*, *C. concolor*, *C. shastensis*, *Lewisia Whitei*, and *L. Finchii*. Plant species discovered by him and named for him by others include *Lewisia Purdyi* Jepson, *Allium Purdyi* Eastwood, *Calochortus Purdyi* Eastwood, *Fritillaria Purdyi* Eastwood, *Lilium Purdyi* Waugh (proved to be synonymous with *L. columbium*), *Sedum Purdyi* Jepson, *Brodiaea Purdyi* Eastwood, and *Erythronium Purdyi* Jepson.

His work with *Hemerocallis* has been commercial only. He interested himself in them rather ahead of most others, and he has nearly fifty varieties including most of the latest introductions, excepting Betscher's multitudinous sorts of which he has about twelve.

Mr. Purdy, now in his 78th. year, with all but four spent on the West Coast, is now writing a book, "My Life and Times." In this a more detailed biography will be included.

FRED H. HOWARD

AN AUTOBIOGRAPHY

The writer is of the opinion that one of the most difficult of tasks is to tell the story of one's life—one's accomplishments in any sphere of endeavor, scientific or otherwise, and to tell it in such a manner that when it reaches the reader it will not be construed as egotistical. I will endeavor to review mine and with deepest apologies to the reader, here are a few facts.

I was born on September 1, 1873 in Los Angeles, California. My father was born near Exeter, Devonshire, England and my mother in Louisville, Kentucky.

At a very early age I developed that which might be referred to as an innate love of nature as expressed in flowers, plants and trees. After

leaving school at the age of eighteen, I decided to devote my life to horticulture and more particularly to that angle relating to plant breeding.

My first extensive experiments were with carnations (*Dianthus caryophyllus*) wherein I made hundreds of reciprocal crosses between those of the English border type and those of the earlier American perpetual class. This latter emanated from the establishment of Alegatiere in France, and the particular strain had at that time been much improved by early American growers. The results were interesting to say the least: an improvement in size of the flower, non-splitting calyx, perpetual blooming characteristics and a magnificent range of new colors not hitherto found in the Alegatiere race, became a patent fact.

Following the early experimental work I decided to enter the field of horticulture in a commercial way and in 1895 founded the firm of Howard & Smith. With this done, the work of plant breeding and the growing of plants for commercial use was prosecuted vigorously. We incorporated the firm in 1906. The members at that time consisted of Fred H. Howard, George W. Smith and Paul J. Howard. In 1914 I purchased the interest of Mr. George W. Smith and from then to the present time, my energies have been devoted not only to the ordinary commercial expansion of the business, but also to cross breeding of plants with the object of producing hybrids of our own raising, but we handle also the worthwhile novelties of other growers. While strides were made in the improvement of perennials and many annual plants, two of the major subjects to which attention was given were *Amaryllis* (*Hippeastrum*) and Roses. The writer covered on Page 189 of the 1937 edition of *Herbertia* the results of the work done in this class of bulbous plants. There is little need of repetition now.

Prior to 1914 several roses, improvements over existing sorts, were originated at our establishment and some of these are still in commerce today.

It was, however, in the year 1916 that wider recognition was gained by the winning of the International Gold Medal awarded by the French Government at the seedling trials of new roses at the Bagatelle Gardens, Bois de Boulogne, Paris, France, with the variety *Los Angeles*. Again in 1921 the Gold Medal was awarded for a new introduction of that year; i.e. the copper colored rose *Lolita Armour*. At that time the Bagatelle Medal had only been won once by an American grower, Mr. E. G. Hill, the Dean of all American rose growers, of Richmond, Indiana.

During the period from 1914 to the present, medals of lesser distinction, gold and silver cups in large number, First Class Certificates and other trophies have been forthcoming, attesting the fact that my efforts were not in vain.

Amongst the various trophies are two, however, which I value most highly. The first: the award of the Cory Cup for our *Amarcrinum Howardii* (or the synonym *Crino-Donna Corsii*) this award having been made by the Royal Horticultural Society of England in 1926 for the best new plant of that year. It is the only time to my knowledge that this



Mauray, Los Angeles

Fred H. Howard—Herbert Medalist, 1939

most highly prized cup has been brought home to the U. S. A., and I am further glad to say—to California the land of my nativity.

The second award above referred to is the Gold Medal of which we were the recipients for our new rose *The Doctor*. This award was made by the British National Rose Society at Regents Park, London, England in 1938.

Lack of space forbids any full enumeration of the many other hybrids emanating from the firm. In passing I might note the various strains of California Giant curled and interlaced asters, California Giant peony flowered types, the beautiful and informal Giant Sunshine and other Giant varieties such as the non-lateral branching shell pink *Los Angeles*; the unsurpassed *Swansdown* in a white, *Maidens Blush* and others, all regarded as standard and sold by seedsmen all over the world. The same fact applies to our strain of Giant Flowered cinerarias which through constant effort over a period of thirty years have reached a stage of perfection the writer believes without peer.

Other subjects which have received intensive attention during the past few years are primarily roses, amaryllis, new double gerberas and zinnias. Of the second mentioned item after years of applied effort, there has been produced a strain which we are of the opinion will stand the test of time and we leave it to others to judge its merits. On the matter of rose breeding, many promising varieties are in the test plots. The fields of our new hybrid double gerberas at this writing are a sight worth a trip of miles to see—over sixty thousand clumps in full bloom in a color range of wide diversity and enormous flowers that reflect twenty years of intensive effort.

The new race of zinnias (to be sent out later) were obtained by reciprocal crosses between the small flowered scabious type and the Giant dahlia flowered class, and if I may use the recent words of a prominent visiting Eastern seedsman, constitute “the most sensational addition to the list of new annuals in a decade.” In this new class, the blooms have a crested center with broad guard petals after the character of a double *Pyrethrum roseum*. They bid fair, on account of their rich color and informal build, to supplant those of the double flat-petaled class as a cut flower. Aside from their distinctive nature it is my opinion that when introduced to commerce they will prove a worthy addition to gardens in every state in the Union, or for that matter, the world as well.

In conclusion, I might say that when through action and applied purpose of thought, wherein a flower or plant of new form or new color raiment, heretofore non-existent except in the abstract, becomes a patent fact, then indeed the sponsor whoever he may be, will derive a sense of satisfaction in having contributed something tangible to the fund of spiritual uplift and human happiness.

IN MEMORIAM—RICHARD DIENER

BERTHA L. LIGHTON,
Formerly Secretary to Richard Diener

Tucked away in Oxnard, California, a quiet little town where the racing tide of the world's traffic misses it, is the nursery and plant breeding establishment of the late Richard Diener. It is quite unpretentious in outward appearances and quite small as compared to many other nurseries in California, but no one who has ever visited this nursery can truthfully say that it is not one of the most interesting ones.

Many of those who visited this nursery in the past have had the pleasure of meeting and talking with this genius of plant life, and those who visit it in the future will see the "Work Shop" and breeding grounds where the patient spirit and persistent effort of this very modest man, once a German immigrant, produced and gave to the world some of the highest perfected specimens of the plant breeder's art.

Mr. Diener spent a great deal of time and patience in the development of hybrid amaryllis. His aim was to produce larger flowers, faster and healthier growing plants. After a number of years of crossing and careful selection, this was accomplished very successfully. Then some years ago, among these highly bred amaryllis seedlings, some very outstanding specimens were found,—some flowered not only during the usual flowering season, from February to May, but also again in the summer or fall. These were used for further breeding and now, flowers may be had at almost any time of the year from the Diener strain of hybrid of amaryllis. The colors range from pure white through all shades of pink, coral, salmon and copper to the deepest red and many flowers measure twelve, fourteen and even sixteen inches across.

These hybrid amaryllis are comparatively easy to grow. They may be planted in the open in climates where the ground does not freeze, or may be planted in the open in the summer and brought indoors in the winter. Or they may be dried up in the fall and re-potted in good rich soil about the last of November. In a living room of average warmth, many will flower within six weeks after planting.

Amaryllis make excellent cut flowers. After being cut they will keep for days in perfect condition. In April 1936, Diener's amaryllis blooms were exhibited in the National Amaryllis Show at Orlando, Florida, and carried away their share of prizes. The flowers were boxed and sent on their 3000-mile journey by Air Express and arrived in such excellent condition that four exhibits won first class certificates and one flower won the first class certificate as the largest flower in the entire show.

Aside from the magnificent amaryllis, many other highly perfected flowers will be found at the Diener Nursery, such as delphiniums, petunias, pelargoniums, Shasta Daisies and gerberas.

It was Mr. Diener's wish that his work be carried on after his death, and like something foreseen, special preparations were made years in advance. He spent a great deal of time with a certain young man, a Mr. William Rohbock, the son of a very good friend, to whom he left his

business and property, so that the results of his work and knowledge gained through his years of experiences might be passed on, and that his methods and plans of his work in hybridizing might be continued. And this young man is ambitious, persistent and determined to take up the work where Mr. Diener left off, so that he will undoubtedly offer to the flower loving public, from time to time, new, improved and interesting developments in the field of floriculture.

Richard Diener was born in Halle, Germany, March 30, 1872, and immigrated to America about 1908. He first settled in Sonoma Valley, California, and was for a time associated with Luther Burbank. He became a naturalized American citizen June 24, 1912 at San Jose, Santa Clara County. He took up residence at Oxnard, California about November 1926 where he resided until his death, August 26, 1938.

SOILS AND MEN¹

R. V. ALLISON,
*Department of Chemistry & Soils,
University of Florida*

The Yearbook of Agriculture for 1938, developed under the impressive title, "Soils And Men," is the most complete treatment of soil science for the lay reader that has ever been published. As might be surmised from the title, it deals not only with the technical nature of soils and the methods that have been developed for their orderly classification and mapping as a basis for all types of work with them but also emphasizes the highly basic relationships they hold with plants, animals and men.

While there is much in the volume that is essential for any lover of plants, whether his preference be for a beautiful amaryllis or a stately forest tree, the paramount theme that pervades the entire volume is conservation. This trend is tersely sounded in two brief sentences that appear in the foreword by the Secretary of Agriculture,—"Nature treats the earth kindly. Man treats her harshly." The appeal throughout is to the civic pride and conscience of all.

In this volume, as never before, effort is made to analyze the problems and causes of soil misuse, to state the horrible implications for the future of continuing the neglect and abuses of the past and to set forth clear, logically developed preventives and remedies. This phase of the treatise is taken up in Part I, The Nation and the Soil.

In Part II, The Farmer and the Soil, a wide variety of subjects are discussed that have to do primarily with the handling of the land—tillage operations, organic matter, methods of mixing and applying fertilizer materials, rotations, irrigation, erosion control, management of forest soils, and numerous other special chapters. Among these of most direct interest to readers of HERBERTIA would be those sections dealing with the determination of fertilizer requirements of soils (p. 469), a detailed discussion of the composition of fertilizer materials (p. 487) and a treatment of soil acidity and liming (p. 583).

¹Year Book of Agriculture, 1938. Government Printing Office, Washington, D. C.

In the section on Soil and Plant Relationships, Part III, the soil requirements of economic plants are stressed both in terms of the so-called major or macro elements and the trace or micro elements. A chapter also is included in this section on the use of plants as indicators. A consideration of the role of trace elements in the culture of plants under greenhouse or other intensive conditions frequently is found of great practical importance.

In Part IV, Fundamentals of Soil Science, the physical, chemical and biological nature of the soil and the relationships of water and of organic matter and humus to it are strongly emphasized as preliminary to a brief discussion of formation and classification. The subject matter of this Section as well as that of Section III should be most helpful in giving a comprehensive understanding of those characteristics of the soil that have so much to do with the normal growth of plants.

Part V, The Soils of the United States, is a comprehensive brief discussion of our soils from a national standpoint based upon "areas" made up of generally similar series. This treatment involves a consideration of geographic setting, climate, native vegetation, parent materials, and the use to which they are locally adaptable.

To those who would like first to obtain a comprehensive notion of the scope of the volume, the excellent summary at the front of the book by Mr. Gove Hambidge is highly recommended.

GREY'S "HARDY BULBS"²

HAMILTON P. TRAUB, *Florida*

We owe Lt.-Col. Grey a lasting debt of gratitude for giving us these three valuable volumes on hardy and half-hardy bulbs, tuberous and fibrous-rooted plants, including selected species, as distinct from garden hybrids, of seven plant families. The work was written by one who has grown many of the plants he discusses, and who has been a professional gardener for seven years and a lover of plants for more years than he cares to remember. Such a work, although it was written primarily for English gardeners, must contain much inspiration for gardeners in other lands.

With reference to the botanical classification used, he states,—“Dr. Hutchinson's grouping appears to me very logical. I do not suppose that it is likely to find general acceptance in the immediate future, but very much regret that it was published³ after the greater part of this work, based on the *Genera Plantarum* of Bentham and Hooker, had been written and set up in type, as it would have given me much pleasure to have based my work on his classification.”

The three volumes contain 43 color plates and 132 black-and-white drawings by Cecily Grey who is to be complimented for an important job well done. The illustrations are of the impressionistic type, and as

²Grey, C. H. *Hardy Bulbs*. Vols. I, II, and III. E. P. Dutton & Co. New York. 1938.

³Dr. Hutchinson's second volume on *Monocotyledons* was published in 1934.

art objects they rank very high indeed. They give us really a truer picture of what we might see than the detailed, more or less "photographic," plates one usually finds in garden books. These numerous stimulating illustrations alone are worth much more than the price of the three volumes. The reviewer knows of no other popular gardening work that offers so many artistic illustrations of rare plant species.

After a brief introduction, in which the subjects "Propagation and Cultivation," "The Rock Garden," "Woodland and Streamside," "The Wild Garden," "The Border," "West-County Garden," "Desert Plants" and "Alpine House" are discussed, there follows the main work which is arranged by plant families. The species are arranged in alphabetical order under the genera. Lt.-Col. Grey has found it necessary to use technical terms in the description of plant species, but he has compensated for this by including in the glossary such terms used.

The first volume covers 50 genera of the Iris Family. As an illustration of the method of treatment, the Genus *Crocus* might be cited. The species described are referred to one of ten classes by means of a Roman numeral following the species name, and at the end of the descriptions, one finds a list of recommended species for autumn, winter and spring. The other genera receive equally appropriate treatment.

The second volume includes the *Amaryllidaceae*, *Commelinaceae*, *Haemodoraceae*, *Orchidaceae*, and the *Scitamineae*. Among the *Amaryllidaceae* one finds the following genera represented,—*Amaryllis* (= *Callicore*), *Ammocharis*, *Apodolirion*, *Brunsvigia*, *Calostemma*, *Chlidanthus*, *Clivia*, *Cooperia*, *Crinum*, *Cyrtanthus*, *Galanthus*, *Gethyllis*, *Haemanthus*, *Haylockia*, *Hessea*, *Hippeastrum* (= *Amaryllis*), *Hymenocallis*, *Ixiolirion*, *Leucojum*, *Lycoris*, *Narcissus*, *Nerine*, *Pancratiun*, *Sprekelia*, *Stenomesson*, *Sternbergia*, *Strumaria*, *Ungernia*, *Urceolina*, *Vallota* and *Zephyranthes*. It is indeed the most up-to-date treatment of the amaryllids from the gardeners point of view, and as such will be eagerly received by the amaryllid enthusiasts.

The third volume is devoted to the *Liliaceae*. A total of 110 genera are treated, including the following genera that Dr. Hutchinson has placed with the *Amaryllidaceae*—*Agapanthus*, *Allium*, *Bessera*, *Bloomeria*, *Brevoortia*, *Brodiaea*, *Leucocoryne*, *Milla* and *Tulbaghia*. The colored plates of *Allium Caput-Medusae*, with petiolate leaves and pendulous reddish-purple flowers, and *Allium cyaneum*, with flowers of brilliant-dark-blue, are especially interesting.

There are minor errors here and there such as the recognition of the invalid species *Zephyranthes Tsouii* Hu, and the plate of *Zephyranthes rosea* showing flowers of very light pink. Errors of this type can be corrected in a future edition, and it would be an indication of ingratitude to dwell on these at any length. Finally it should be emphasized that Lt.-Col. Grey has achieved to a remarkable degree the object that he had in view, and that is after all the important fact.

IN MEMORIAM—ALBERT G. ULRICH, SR.

It is with the deepest regret that we record the death of Mr. Albert G. Ulrich, Sr., who died, August 28, 1939, at his home, 3966 Arsenal Street, St. Louis, Missouri, after an illness of two weeks. He was a native of St. Louis, 72 years old and had been a piano tuner for the past forty years. His favorite avocation was horticulture. He maintained a flower garden at his home that contained a great many species and varieties of roses, amaryllids, peonies and other ornamental plants, and his home grounds became a beauty spot of south St. Louis. He frequently wrote and lectured on the appreciation and care of flowers and birds. He was a charter member of the American Amaryllis Society, and a member of its Membership Committee for the North Midland.

Mr. Ulrich was also a musician and played the violin at many St. Louis concerts and church functions. He is survived by his widow, the former Miss Martha V. Wolf; his mother, Mrs. Mary Ulrich, and a son, Albert G. Ulrich, Jr.

SIR JOHN HILL, 1716-1775

Elsewhere in this issue of *Herbertia* the work of Sir John Hill is mentioned, and we take this opportunity of directing the reader to a brief biography of this versatile gentleman.

This is not the place for an estimate of Dr. Hill's rank in the history of science but it should be pointed out that he was one of the most versatile men who ever lived. He was endowed with remarkable talents but with a temperament that drew him into many controversies that dissipated his energies. However, his botanical works are as a rule not involved. For a preliminary estimate of Dr. Hill see "The Versatile Sir John Hill" by L. L. Woodruff, (*Amer. Nat.* 417-442. 1926). He was one of the best informed scientific men of his day. He has been credited with the making of improvements on the compound microscope; the first use of a dye in microscopic work—the use of carmine in studying the ascent of sap, in 1770, an initial attempt to classify protozoa, coining such names as *Paramecium*, that are still in use; the mentioning of the relationship of insects to pollination a decade before Koelreuter; the introduction to English botanists of the Linnean system of plant classification; and initial attempts in presenting the subject of botany to classes by the laboratory method. Disraeli says of him—"Sir John Hill, . . . after all the fertile absurdities of his literary life, performed more for the improvement of the Philosophical transactions, and was the cause of diffusing a more general taste for the science of botany, than any other contemporary."—Ed.

1. REGIONAL ACTIVITIES AND EXHIBITIONS

AUTUMN NATIONAL AMARYLLIS SHOW,
POMONA, CALIFORNIA, SEPT. 22-23, 1938

CECIL HOUDYSHEL, *California*

The Annual Fall Amaryllis Show, sponsored by the American Amaryllis Society, was held on September 22 and 23, 1938, in connection with the Floral Section of the Los Angeles County Fair, at Pomona, California.

In the extent of space used and in the number of species and varieties exhibited there was considerable improvement over the preceding year. There were also a few new exhibitors.

The difficulty we experience in having a greater number of flowers to show on a particular date we presume would be encountered anywhere but perhaps in a lesser degree than in Southern California. Here we have almost all kinds of climates from desert, hot interior valleys to mountains, canyons and cool coasts. Some regions are cool and foggy, some have continuous dazzling sunshine. So the species have a different blooming date in nearly each section. Many species are very erratic too in this date. Nerines especially (at least in our experience) are very erratic. We have had flowers in September and even as late as January.

For these reasons two very important Santa Barbara Nurseries, the Orpet and the Las Positas Nurseries, having had an earlier-than-usual season were unable to exhibit.

The Los Angeles County Fair offered liberal cash prizes up to \$25.00 and probably every exhibitor received enough in prizes to pay at least their expenses. All exhibitors were commercial growers and the attention and interest their exhibits received were of considerable advertising value. The promotion value for amaryllids was no doubt much greater. Considerable promotion was given by the press and one Press Service is still furnishing amaryllis pictures for garden pages.

The Richard Diener Nursery, of Oxnard, showed more than fifty umbels of the Diener strain of hybrid amaryllis. As is well-known, this strain is noted for its profuse blooming habits. They bloom normally in the spring as do other hybrids. Again in the fall a very good crop of flowers are produced, with enough in between these times to rank them as the nearest ever-blooming strain. The flowers are immense, probably the largest known. The colors shown were from pure white to various tones of red and pink. The exhibit attracted much attention and won a First Prize Ribbon.

Mrs. Leonard Swets, Riverside, showed the Blue Ribbon vase of *Lycoris radiata*. There were several other vases of this favorite amaryllid shown. It is a favorite garden bulb in California and is still often called "*Nerine sarniensis*." Mrs. Swets also showed a fine bloom of *Valotta purpurea* which won a first. Mrs. Swets is to be complimented for her ability to grow such fine specimens of this rather difficult species. The

writer is not able to do it. There are several commercial growers of valottas in Southern California but no others seemed to have flowers to show.

Mrs. Swets also received Second for *Amaryllis* (*Hippeastrum*) species and *Amaryllis miniatus*: Third for *Callicore rosea minor*. In the Sweepstakes she ranked Second with a cash prize of \$20. She had two first, two second and two third prize ribbons.

Mrs. Swets grows some very fine *Amaryllis* (*Hippeastrum*) hybrids for the commercial production of seeds.

E. P. Zimmerman, of Carlsbad, showed his beautiful Callicore hybrids, receiving a Blue Ribbon on them. The colors ranged from nearly pure white, light pink to very deep pink with many variations in the markings. He also received First on *Crinum Powellii album*, *Hemerocallis* species, and on a new, unnamed *Amaryllis* (*Hippeastrum*) species. In Sweepstakes Mr. Zimmerman placed third with a cash prize of \$15.

Mr. Zimmerman is the most important breeder and grower of clivias in the U. S. and ranks high if not highest for the world. He estimated the number of his plants a year ago at 30,000,—and he is increasing the size of his houses rapidly. Clivias bloom only rarely out of season here, but the show date was only a couple of weeks too late to receive several nice plants.

The writer, Cecil Houdyshel showed the largest number of species, receiving 12 Firsts, 3 Seconds and 1 Third and therefore the Sweepstakes prize. Too much credit cannot, however, be gleaned from this fact as we can scarcely be called specialists on any one type of amaryllid (unless it be *Crinums*) and the nature of our retail mail order business requires the growing of as many species as possible. The other exhibitors grow quantities of only a few species in which they specialize.

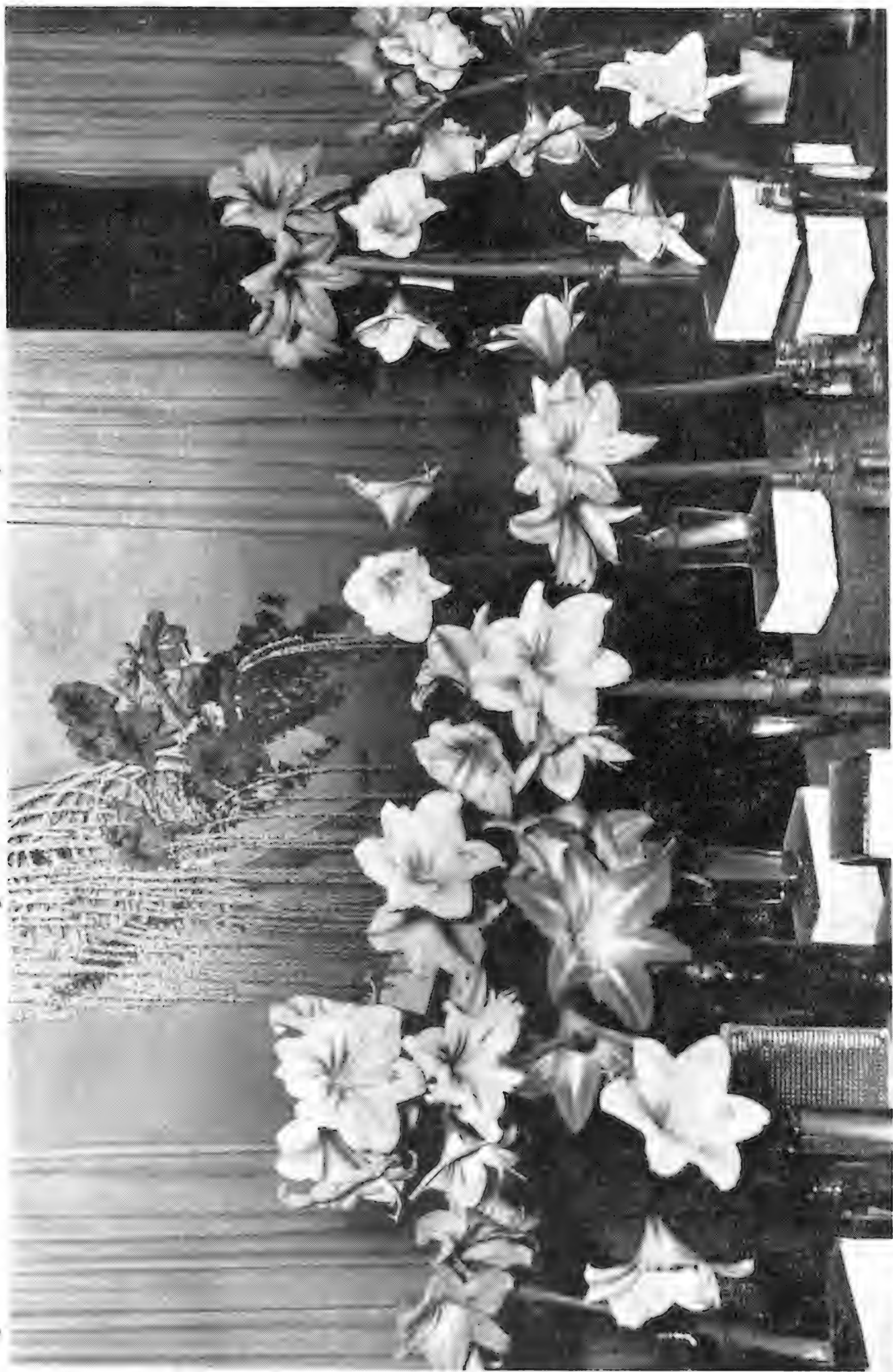
IMPRESSIONS OF THE NATIONAL AMARYLLIS SHOW, JACKSONVILLE, FLA., APRIL 11, 1939

EVA NOBLE, *Chairman*

*Publications Committee, Federated Circles of Garden Clubs,
Jacksonville, Florida*

The Garden Club of Jacksonville (composed of 69 circles) was very proud to sponsor the annual show of the American Amaryllis Society for 1939. The date was set for April 11, and the usual amount of anxiety was felt before the day came, lest there be no flowers to show. The outcome was also as usual—there were many flowers, and the display was a revelation to many people who had not had the opportunity to study amaryllis as thoroughly as now when so many colors and kinds were assembled in one place.

The auditorium of the Woman's Club, where the show was held, was given over to the display of representatives of the very large family of amaryllis. Long tables were ready with wide aisles between to give the feeling of spaciousness necessary for such large flowers. The background was neutral—a soft buff-colored paper covered the tables, and



Federated Garden Club, Jacksonville, Fla.

Russell S. Wolfe Exhibit at National Amaryllis Show, Jacksonville, Fla., Spring 1939

the wall pockets were painted the same shade as the wall. This also was a concession to the emphatic color personalities of amaryllis. Glass bricks were used to prop the containers with their top-heavy blossoms. The wall pockets held arrangements of amaryllis with other flowers or foliage—these arrangements having been assigned to former ribbon winners in flower shows. The whole effect was well-balanced and very colorful indeed.

Several other features had also been planned for the show. The stage was set as a Garden Center—that dream of every ambitious garden club. Just below the stage were two Spanish carts—one on the right and one on the left. One of these housed a demonstration of orchid growing by Mr. and Mrs. Bruno Alberts, of the Orchid Farm, Mandarin. It showed the seed through the years of nursing until the time when the exquisite blossoms should appear,—an average of seven or eight years. The ungainly strap-leaved plants with their precious weight of perfect blossoms was a worthy complement to the main show. The other cart contained an educational exhibit, in charge of Mrs. W. D. Diddell and Mrs. Philip Trout, and was an ensemble of rare and unusual plants of any kind whatsoever. Both these carts were centers of interest.

The sun room of the Club was given over to arrangements of Spring flowers, in attendance on “The Court of Amaryllis.” The lounge of the Club held an intriguing display of the collection of rare books and prints of flowers and birds and Mr. and Mrs. Alonzo P. Boardman of Augusta, Georgia, the owners, were present to explain the books and the merits of the artists.

The show was one of varied interests, but not for a moment did the amaryllis fail to hold the spotlight. It was the queen for the day and night, and all else was subordinate. Even the orchids remained respectfully in their corner and bowed their heads to the reigning monarch.

Visitors came first to see the amaryllis and also came last, so as to carry away the memory of satin petals, delicately marked, and unbelievable colors ranging from vivid scarlet to purest white. The size of the flowers was a matter of amazement. Indeed, mere human beings were apt to be awed in the presence of such enormous flowers, so that it was comforting to hear growers say that color and texture were constant aims for improvement, rather than an increase in size.

The list of out-of-town exhibitors included the following: Robert H. Jewel, New Rochelle, N. Y.; Russell Wolfe, Orangeburg, S. C.; Dr. Albert Fleming, Folkston, Ga.; William J. Leseman, Green Cove Springs; R. N. Wheeler, Orlando; and M. C. Varnier, Fort Pierce. The Howard Seed Company, Jacksonville had a fine display of bulbous plants.

The judges were Mrs. G. Walter Potter, Mrs. Vivian Collins, St. Augustine; Mrs. Endor Curlett, Sanford; Mrs. Addison Pound, Mrs. M. M. Parrish, Gainesville; Dr. H. H. Hume, Gainesville; E. L. Lord and R. W. Wheeler, Orlando, and C. J. Hudson, Jacksonville.

It seemed to the amateur flower lovers that these learned men and women could develop the fine points of the amaryllis like working out a theorem in geometry, and as for the hybrids and their ancestral history,

it was far beyond the comprehension of ordinary people but anyhow, respect and admiration for amaryllis in their complicated genealogy was greatly increased by the show.

Mrs. Frederick McConnel, President of the Garden Club, Mrs. Frederick Waas and Mrs. Millar Wilson, Show Chairmen, Mrs. W. E. MacArthur, who wrote countless letters to possible out-of-town exhibitors, and other members of special committees, worked hard to make the show the success which it was. Mr. Wyndward Hayward and other officers of the American Amaryllis Society, deserve the gratitude of flower lovers for their valuable assistance.

Newspapers and magazines were most generous in giving publicity to the event. We who were whole-heartedly interested in the show and feel that it served the purpose of any true flower show—it gave pleasure to all comers, and it spread a desire to grow more amaryllis, for even “Solomon in all his glory was not arrayed like one of these.”

TWO DAFFODIL SHOWS IN MID-WINTER

JAN DE GRAAFF, *Oregon*

The Christmas Show in Sassenheim, Holland, December 23, 1938 which was held the week before Christmas provided an opportunity for the leading Holland growers to show what modern hybrid daffodils, cured and prepared along the latest scientific lines, could do to increase the variety of flowers available during the holidays.

As one of the trade papers reported: “A few years ago it would have been beyond one’s dreams to expect a large collection of new daffodils so early. Now at Sassenheim there was not one collection but two, each one worthy of the large silver cup that was offered. After long deliberation the special jury decided that, since both collections were equally worthy and since there was only one cup offered, they would themselves pay for an exact duplicate of the cup and in this way reward both exhibitors.”

The prize winning collections were shown by Messrs. Warnaar & Co., and by de Graaff Brothers Company, and contained among others the following varieties: Fortune, Magnificence, Mrs. Barclay, St. Agnes, Livia, Decency, Mary Florence, Scarlet Leader, Francisca Drake, Marion, Achievement and Golden Attraction. Scarlet Leader is especially mentioned in the reports that I received as one of the finest daffodils at this Christmas show.

Other exhibitors brought good flowers of Helios, Godolphin, Giant Perfection, Alasnam, Orange Cup and M. van Waveren & Sons brought a pan of Magnificence with six bulbs and twenty-six flowers of good quality.

It must be mentioned that at that time Holland was “enjoying” a Siberian winter and that it was, therefore, all the more noteworthy that such a large special show could be held.

It would be impossible to mention or report on all the special flower shows held each Monday in the General Bulb Growers Society’s rooms at Haarlem, Holland, but the show of January 2, 1939, deserves special



Mohr Bros., Copenhagen

See page 60

Mohr Bros. amaryllis exhibit, Copenhagen, Denmark, Flower Show, 1938, upper; Mohr Bros. amaryllis greenhouse, lower. Note that Mrs. Mohr appears at the left.

mention as it was a remarkable exhibition of growers' skill. Many daffodils were shown and, as required by the Society's rules, the treatment that the bulbs had undergone before forcing was reported to the public. We find that several varieties of daffodils exhibited were not treated in any special way. Of these, February Gold, the attractive cylamineus seedling, and a new yellow trumpet called Innovation were outstanding. Another group of daffodils was grown in a normal way, but the bulbs had been cold-storaged before forcing. Of these special mention must be made of Orange Glow, Poeticus Dulcimer and Incomparabilis Clamor.

The last group consisted of bulbs grown in a cold greenhouse, in which they normally ripen a couple of weeks before bulbs grown outside. After a short period of curing, they were cold-storaged and subsequently forced. Among the varieties treated in this manner were Leedsii,—Mrs. Nette O'Melveny; White Trumpet,—Ada Finch; and several others.

These methods of treatment have opened entirely new vistas to the daffodil growers. No longer is earliness under normal field conditions an indication of the value of a new flower to the greenhouse men. We now find that many so-called late varieties react very favorably to cold storage treatment and that, therefore, they have at least equal value for forcing as the early types.

MOHR AMARYLLIS EXHIBIT, COPENHAGEN, DENMARK, 1938

WYNDHAM HAYWARD, *Florida*

What is undoubtedly the largest indoor culture of hybrid amaryllis in northern climates is being developed near Glostrup, Denmark, by Mr. O. Mohr, a member of the American Amaryllis Society for several years and a sincere lover of amaryllis and related plants. Mr. Mohr is a member of the firm of Mohr Bros., which has been a leading rose grower and producer of forced flowers in Denmark for a number of years.

Mr. Mohr sent the Society the pictures which are reproduced in this number of *Herbertia*, showing the large greenhouse of the bulbs with Mrs. Mohr in the foreground and a display of hybrid amaryllis blooms from Mr. Mohr's commercial collection at the Fall 1938 Copenhagen flower show (Plate 134). Mr. Mohr writes that because of the "crisis" at that time, attendance was low.

The collection was built up recently by purchase of seeds and bulbs from the leading commercial Amaryllis growers, breeders, hybridizers in America and Europe. Mr. Mohr expects to have more than 100,000 blooming size bulbs in another year. His collection includes numbers of pure whites, deep self reds and many other desirable shades. He was planning to send some bloom spikes to the 1939 Chelsea Flower Show of the Royal Horticultural Society in England as an experiment, last May.

The bulbs will be used to produce cut spikes of bloom for sale in the European flower markets, and also for the production of fancy pot plants as well as breeding stock.

THE 1939 AMARYLLIS SHOW OF THE BUREAU OF PLANT INDUSTRY U. S. DEPARTMENT OF AGRICULTURE

The twenty-sixth annual Amaryllis Show of the U. S. Department of Agriculture was held at the Department Greenhouse, Fourteenth Street and Constitution Avenue, N. W., Washington, D. C., from March 25 to April 2, 1939, inclusive. It was open each day from 9:00 a. m. to 9:00 p. m. and was viewed by 28,338 people.

The exhibition comprised 1,260 amaryllis bulbs, each bearing two or three flower stems with two to seven flowers on each stem. Thus there were displayed several thousand flowers ranging in color from dark velvety red through various shades of red, pink, orange, yellow-orange and striped types to pure white. The plants were arranged in the exhibition house on two side benches and on a center elongated pyramidal staging. Small pots of *Vinca major* with rounded grey-green leaves edged with white were placed between the pots of amaryllis to form a pleasing combination with the pointed dark green leaves, thick silvery green flower stems and clear bright blossoms of the amaryllis. Baskets of *Streptosolen jamesonii* and Lantana Weeping Lilac-rose were hung alternately from the roof of the greenhouse. Several large pots, each containing a group of bulbs in flower, were placed along the ridge of the center staging to provide accent notes.

The bulbs in the Department's collection of amaryllis are hybrids resulting from many years of breeding work carried on by Department of Agriculture experimenters since 1909 when twelve varieties were imported from England. The Amaryllis Shows are exhibitions of the work to produce improved plant forms. Department workers with amaryllis have successfully endeavored to obtain longer stems, new shades and larger flowers. The white amaryllis was produced through successive selection and cross-pollination of striped flowers showing the most white. A group of seedlings, flowering for the first time this spring, revealed larger flowers, longer and heavier stems.

SEVENTH NATIONAL AMARYLLIS SHOW MONTEBELLO, CALIFORNIA, 1940

The Seventh annual National Amaryllis Show will be held next spring in Montebello, Calif., at the Howard & Smith establishment, according to plans announced in September by a committee of the California members headed by Messrs. Fred H. Howard, W. E. Rice and Cecil Houdyshel.

The tentative dates are April 12-14, 1940, Friday, Saturday and Sunday, two weeks after Easter.

Mr. Howard will grant the Society the use of his Nursery and greenhouse display rooms for the exhibition, free of charge and will provide assistance by his staff of employes. It is contemplated to set an admission charge of 25 cents for the show, the proceeds derived from the sale of admissions to go toward the expenses of publishing the Society's yearbook, *Herbertia*.

Further information can be obtained by writing to Mr. Fred H. Howard, Montebello, Calif., or Mr. Cecil Houdyshel, LaVerne, Calif. Plans for the 1940 show were first drawn up at a meeting of members of the Society at Mr. Houdyshel's home in LaVerne, Calif., during the Los Angeles County Fair in September, 1939, when the annual Fall Amaryllis Show sponsored by the Society was in progress.

2. COLOR DESCRIPTION

THE ROYAL HORTICULTURAL SOCIETY COLOR CHART

EDWARD STEICHEN, *Connecticut*

The first volume of the Royal Horticultural Society Color Chart is sufficiently complete in itself to establish its value as a standard for color nomenclature in horticulture. It is practical in its application and, most important of all, considering the great expense of such an undertaking, it is sold at a very reasonable price.

I have used it extensively during the course of this past summer in checking the colors of numerous kinds of flowers. All flowers that come within the scope of the present volume can easily be "color analyzed" with reasonable accuracy. There are, however, some flowers that will have to await the publication of future volumes and additional color charts before they can be described. There are also certain elements which go into the making of a color impression, such as the gradation of merging tones, which no description based entirely on a chart can completely solve. There is also the matter of under and overlay of warm and cold colors and of texture differences changing the general impression of similar or like colors.

It is a mistake to imagine that all you have to do is open up the book and juxtapose the color samples of the chart with flower petals. Anyone who plans to use the book must give the matter considerable time and study. It will be necessary to become familiar with and adopt the exact meaning of the terms, color, hue or shade that are used in the book. The technical meanings of these terms as described in the book are often quite different from the general conception of their meanings. The chart does not actually solve the problem of defining colors for you but materially assists you in defining them accurately. The chart acts as a measuring meter. It requires careful and considered use; it cannot reliably be used in the field because of changing light conditions there. All the comparisons should be made by a window with north light, and preferably towards the middle of the day so that a reasonably constant comparison factor is obtained. The readings made by an inexperienced gardener are apt to be only fairly accurate because of variations in the human judgment equation.

In comparing the judgments of an artist, a color photographic technician, and an interior decorator, their readings were found to be about 95% alike. In testing it on four gardeners, who were without previous experience in color matching and without any knowledge of the theories of color contrast, etc., the results were less than within 75% in accord. I am sure that these same gardeners with more experience with the chart would come closer to an accord. It is easy to foresee that whereas an experienced and color-sensitive person might describe the color of a flower as he saw it in the terms of the color chart, a purchaser of the plant, without any experience and with a casual comparison with the chart may violently disagree with the description and be a dissatisfied customer. This brings up the question of the practical value of such a

chart. It can be of no value to the general plant-buying public unless they can be induced to buy the chart and to learn how to use it. I doubt whether it is reasonable to expect this to happen. To the breeder talking to the grower or to the distributor it can be an entirely satisfactory means of color description, and it can be of like value to the botanist in speaking to another botanist about the color of plant material.

I hope the Amaryllis Society officially adopts the book and thereby gives the theory of standardized color nomenclature a real and general working test. Until such a working test is made by a considerable number of gardeners and horticulturalists who have a similar interest we cannot know how valuable or how useful such a chart may become. It is well for all of us to bear in mind that even if this chart were as accurate a color-measuring device as the spectroscopic photograph can be, it does not mean that we have solved all of the problems of describing the color of a flower. There are certain subtle complex psychological factors involved in our emotional reaction to flower colors that this form of measurement cannot describe. I believe that these reactions are more responsible for the preferences people have for certain flowers than a factual description of the colors can reveal. In this connection we must also bear in mind the prejudices that breeders or growers are sure to have in favor of new breaks in color which, after they are no longer new, may be meaningless. For instance, I am inclined to doubt the eventual popularity of the fulvous and chocolate and mahogany colored daylilies, unless they are varieties producing 8 to 10 inch flowers. I would be willing to bet heavily on the future of a pure white or clear rose pink colored daylily.

Among Oriental poppies there has recently been introduced a flower of a new and unusual color break. It is a brilliant and vivid watermelon pink color, called "Wunderkind." This color apparently has been welcomed and regarded as a sensation by many specialist poppy growers and some gardeners. In my garden I have found that without exception people with a cultivated color taste, and without knowing of the unusualness or newness of this particular color in poppies, thoroughly dislike it. I have heard it variously called "horrible," "vulgar," and "rasping." It takes more than an accurate color description of a flower to make people love it.

3. DESCRIPTION, CLASSIFICATION AND PHYLOGENY

A REVIEW OF THE GENUS CYRTANTHUS

R. A. DYER,

Division of Plant Industry, Pretoria

This review of the genus *Cyrtanthus* arose mainly out of a suggestion by your Editor. He thought it would serve a useful purpose if the information recorded since the *Flora Capensis* of 1896, were correlated with earlier literature. In the preface to 1938 *Herbertia* he wrote "Other plant subjects that are coming into their own are *Cyrtanthus* * * * * * *Cyrtanthus* appear to be excellent for forcing and some of the species at least are of the easiest culture. As pot plants they are unexcelled".

The following review has been prepared in a relatively short time and is consequently a preliminary treatment not intended to take the place of a careful monograph, which is none the less desirable. A monograph in the present state of our knowledge would, however, be premature. There are too many species about which only incomplete information exists. It has, moreover, been a serious handicap to the writer to undertake this review without the opportunity of making a critical examination of the material at the Royal Botanic Gardens, Kew, which formed the basis of Baker's monograph in the *Flora Capensis*, 1896. To have made a request for the loan of the Kew material in such troublous times as exist at the moment was out of the question. It is most desirable that collectors and growers alike should co-operate with scientific institutions to accumulate helpful data with a view to making possible a monograph at some future date. Further information is required on such points as the plants as they grow in the veld and under cultivation, the nature of the bulbs, whether the leaves are contemporary with the flowers, how long they persist, their shape, the shape of the perianth-tube and of the lobes, the colour of the flowers, and particularly any details likely to be lost during the preservation of a specimen for incorporation in a herbarium. Complete specimens, accompanied by careful notes and sketches or photographs, are invaluable to the scientific worker, who is entrusted with the task of revision. Locality records are often of considerable assistance in the task of identification, absence of them is a frequent source of confusion.

Based on present records, *Cyrtanthus* is the largest genus in the family *Amaryllidaceae* in Africa, consisting of 44 species.

BRIEF HISTORY OF THE GENUS

The name *Cyrtanthus* meaning "curved flower" was established by W. Aiton in 1789 in his "*Hortus Kewensis*". He used it for the two species *C. angustifolius* and *C. obliquus*, both of which had previously been described by the younger Linnaeus in 1781, under the generic name *Crinum*. From time to time further species were described by different authors, but not always under the generic name *Cyrtanthus*.

When, in 1837, William Herbert, after whom "*Herbertia*" is named, reviewed the genus in his "*Amaryllidaceae*", he laid the foundation of our present conception of the genus, enumerating 10 species under *Cyrtanthus* and one under *Gastronema* (*G. clavatum*). Previous to this, however, he had considered *C. obliquus* (one of Aiton's foundation species) to differ so much from the rest of the then known species, that he adopted the generic name *Monella* for the latter group. This classification he soon found it desirable to modify, especially when *C. carneus* became known to him, since this was a connecting link between the *C. obliquus* and *C. angustifolius* types of flower.

The next piece of work of importance was the monograph of J. G. Baker who, in 1888, published his "*Handbook of the Amaryllideae*". Having 20 species under his examination, he went a step further than Herbert and combined the genus *Gastronema* with *Cyrtanthus*, which latter he proceeded to subdivide into three subgenera: *Cyrtanthus proper*, *Monella* and *Gastronema*, using for his subgeneric names, it will be noted, the two generic names which he placed in the synonymy of *Cyrtanthus*.

By 1896, when Baker monographed the genus for "*Flora Capensis*" he enumerated 24 species but increased this number to 26 in the addendum to the volume.

It may be mentioned in passing that Baker placed *C. vittatus*, for which no locality record is available, in the subgenus *Monella*, where it does not happily belong; in fact I have some doubt as to whether it belongs to *Cyrtanthus* or if it represents an indigenous South African plant. It is only known from the coloured illustration in Redoute's "*Les Liliacées*", an adaptation of which is reproduced here to enable anyone possessing definite knowledge of its true identity or habitat to make it known. Several other modifications to Baker's classification in "*Flora Capensis*" have been necessary. These will be referred to under the respective species.

Baker records two species in "*Flora of Tropical Africa*"; *C. Welwitschii* and *C. sanguineus* (also in South Africa).

Since Baker's time a further 16 specific descriptions have been published by various authors. When describing for the first time, *Cyrtanthus Fergusoniae* in "*South African Gardening and Country Life*", 1931, Dr. L. Bolus took the opportunity to make a few general remarks on the genus. Embodied in this article is the original description by Barker, of the smallest known species in the genus, namely *C. flavus*.

My examination of the herbarium material housed in the main South African herbaria has revealed three groups of plants which appear to be undescribed and to merit specific rank. For these I have used the names *C. falcatus*, *C. attenuatus* and *C. bicolor*. Two varieties have been established under *C. stenanthus* and *C. Mackenii*. There are other specimens, the identity of which remains uncertain. Fuller information must be sought in the veld to fill in the unavoidable gaps in our present knowledge. Thus with additions and subtractions to previous conceptions, the number of species dealt with here is 44.

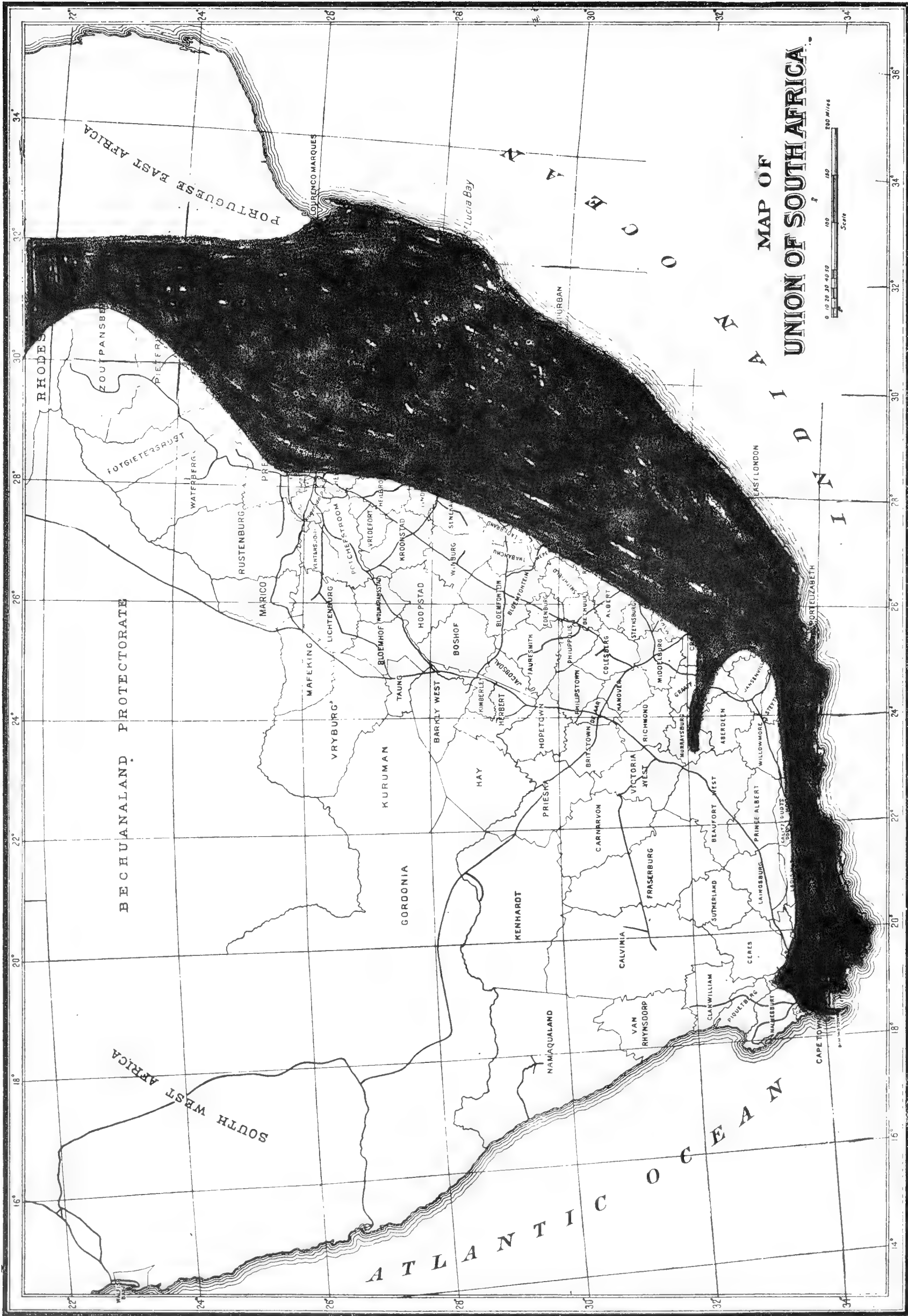
From time to time, by the discovery of additional species, the artificial barriers between the subgenera established by Baker have been



R. A. Dyer, Pretoria

See page 70

Cyrtanthus Mackenii Hook f. in a Pretoria, South Africa, Garden, June 1939



See page 69

Distribution map of Cyrtanthus in South Africa; the shaded area indicates the range.

progressively destroyed. Even the gap between the the two genera *Cyrtanthus* and *Vallota* has been closed further by the discovery of *C. Guthrieae*. In the words of the author of the species, Dr. L. Bolus "The spread of the perianth and the relatively long tube are more characteristic of *Vallota* than *Cyrtanthus*, but there is no doubt the two genera are very closely related, and *C. Guthrieae* may almost be considered a connecting link". In view of my present uncertainty on the most useful method of subdivision, I have decided to dispense with subgenera.

DISTRIBUTION

The genus *Cyrtanthus* is restricted to the continent of Africa. Here it has its northern limit in Angola and British East Africa represented by *C. Welwitschii* and *C. sanguineus* (fide Baker), respectively. More extensive collecting in the tropical area may well reveal further species in this area but on present records the only other species recorded outside the Union of South Africa is *C. rhodesianus*. Within the Union the number of species steadily increases from the north on its way through the Transvaal and Natal to the eastern Cape. The eastern Cape may be looked upon as the headquarters of the genus, for as the western Cape area is approached the number of species again decreases. The distribution from the north lies mainly along the mountain ranges in moist places, in open grassveld and on cool rock ledges. Unlike many other genera with bulbous rootstocks, *Cyrtanthus* is not represented in the arid Great Karoo nor in the equally dry area of Namaqualand. *C. Macowani*, however, is found as far as Murraysberg overlooking the Karoo but even here the conditions on the mountain ranges are not excessively severe. And, further, a very few species, for example *C. Smithiae* and *C. helictus* penetrate semi-arid areas in the eastern Cape Province, such as the Great Fish River Valley, where, under exceptional conditions, the rainfall may be as low as 12 cm. (5 ins.) over a period of a year. (See Plate 136.)

Some species are apparently extremely rare, whereas others are excessively common. In the midlands of Natal after grass fires in the early spring, one may gather literally baskets full of *C. contractus*, the red "fire lily" as it is popularly known. It may be found commonly in unburned grassveld also but the grass fire does appear to have a stimulating effect. The common name "fire lily" is not restricted to *C. contractus*. Several other plants, including *Anoiganthus breviflorus* Baker, also pass by that name in certain areas.

C. Mackenii and the newly recognised variety *Cooperi* are frequent in the southern parts of Natal and eastern Cape extending from the coast to the high mountain ranges inland. These plants commonly known as "Ifafa lilies" are possibly the most widely cultivated forms locally.

CULTIVATION

To those eager for cultural hints I come more or less empty handed. But it will no doubt interest them to hear what Herbert had to say in this respect in 1837, remembering of course that only about a dozen

species were known at the time. Referring to *C. obliquus* and *C. carneus*, he observes that he found them "altogether plants of difficult culture, the bulbs being more disposed to dwindle and rot than to increase in bulk" the greenhouse usually being too damp for them in winter and the air of a hot stove too confined. Speaking generally, Herbert remarks that "a light soil which is not retentive of water will be found to suit the whole genus". On the other hand he found that there is some peculiarity in the soil congenial to them which is very difficult to analyse. In support of this he says, "When I lived at Mitcham in Surrey, *C. angustifolius* was a weed with me, ripening seed freely and the seedlings quickly came to a flowering age and were vigorous, being potted in soil of Mitcham common".—"Since I have lived in Yorkshire I have been able to find no soil that suited it—nor have I found any species of *Cyrtanthus* succeed well in the soils to which I have access here". His experience led him to believe that "a soil that is more disposed to set firm and not fall to pieces when turned out of the pot", should be used but "the difficulty is to find a light soil which has a little tenacity".

How much further has our knowledge advanced on this interesting question of successful cultivation in the 100 years elapsed since Herbert made his observations? If all the information possessed by growers throughout the world were available for incorporation here, it would probably be found to be considerable. Unfortunately I have little advice to give. The notes on distribution and habitat and the general information accompanying many of the specific descriptions in the enumeration which follows later, should afford useful hints as to the treatment most likely to produce satisfactory results. In another article in this issue Miss K. C. Stanford makes several interesting remarks bearing on the subject.

Many gardens of the Natal coast have luxuriant borders of *C. Mackenii* in sandy loam. My neighbour in Pretoria, a photograph of whose plants (Plate 135) appears in this volume, does well with this species in a light sandy loam enriched with well-rotted farm manure.

Those species which normally flower with the leaves stand more liberal watering than those accustomed to a longer resting period without leaves.

ACKNOWLEDGMENTS

To have undertaken the review of such a genus as *Cyrtanthus* within a relatively short time certainly has the air of foolhardiness. Had it not been for the generous loan of herbarium specimens from all the more important herbaria in South Africa it would have met with certain failure. I owe special thanks to the Curator of the Bolus Herbarium, The Directors of the South African Museum and of the Albany Museum, and to the Mycologist in Charge, Natal Herbarium, for the loan of specimens. Miss M. E. Connell, artist at the National Herbarium, Pretoria, has adapted illustrations from various botanical works to suit the requirements of the article and has prepared three original drawings; and several other colleagues have aided me in sundry respects, for all of which assistance I am very grateful.

GENERAL

The "key" to the species which follows later is by no means an infallible avenue for the identification of the species. It is a rough guide, in parts constructed from descriptions and figures, and this point must not be lost sight of. To aid further towards identification, figures of the inflorescences and leaves are given of a number of species. These have been adapted as far as possible from type figures or figures of authentically named specimens. Always read the descriptions and locality records before finally deciding on any identification. The presence or absence of leaves at the time of flowering must not necessarily be considered of specific importance, since some species are known only from cultivated plants and others only from wild plants. In the wild state some bulbs of species such as *C. contractus* may produce flowers before the leaves, whereas others, within a radius of a yard or so, may have a leaf well developed by the time of maturity of the flowers. In this and other similar species bulbs may not flower every year, and those which do not bear an inflorescence, usually produce leaves earlier than their neighbours with inflorescences.

CHARACTERS OF THE GENUS CYRTANTHUS

Rootstock a tunicated bulb. *Leaves* contemporary with or produced later than the inflorescence. *Peduncle* or scape hollow or rarely solid. *Flowers* umbellate, subtended by 2-4 bracts, suberect, nodding or pendulous; *perianth* tubular for more than half its length; *lobes* subequal nearly as long or considerably shorter than the tube, 3 outer lobes furnished within the apex with an incurved point or tuft of hairs. *Stamens* usually inserted in the perianth tube, anthers oblong, dorsifixed, versatile. *Ovary* three-celled; ovules numerous, crowded, superposed; *style* long, filiform indistinctly or distinctly three-lobed at the stigmatic apex. *Capsule* mostly oblong, loculicidally three-valved; seeds flattened, somewhat winged, testa black.

KEY TO THE SPECIES

- A. Flowers several to many in an umbel, rarely three or less, perianth not bell-shaped:
 - B. Bulbs large, 6-10 cm. diam., partly above ground, copiously covered with dry leaf-bases; leaves somewhat leathery, strap- or sickle-shaped, 3-6, rarely only 2 cm. broad:
 - C. Leaves strap-shaped, twisted once or twice at maturity, rounded at the apex:
 - D. Perianth-throat about 2 cm. wide; tips of lobes slightly converging 1. *obliquus*.
 - DD. Perianth-throat about 1 cm. wide; lobes slightly spreading 2. *carneus*.
 - CC. Leaves sickle-shaped, not twisted, contracted gradually to the apex; perianth throat about 1 cm. wide 3. *falcatus*.

- BB. Bulbs rarely up to 4 cm. in diam., leaves from filiform up to 2.5 cm. broad (up to 4 cm. in *C. Huttoni*):
- E. Flowers yellow, cream or white, suberect or spreading:
- F. Perianth not constricted at the throat:
- G. Flowers white 6. *Mackenii*.
- GG. Flowers yellow or cream:
- H. Bulb and neck inclusive 5 cm. or less long:
- I. Perianth 2 cm. long, broadest about the middle; flowers 2-3, yellow 4. *flavus*.
- II. Perianth 2.5-3 cm. long, tube narrowly funnel-shaped, lobes slightly connivent to slightly diverging 18. *bicolor*.
- III. Perianth 3.5-5 cm. long, lobes spreading or reflexed:
- J. Leaves 5-10 mm. broad present at the time of flowering; bulbs increasing by budding 6. *Mackenii* var. *Cooperi*.
- JJ. Leaves filiform or up to 2 mm. broad, absent at or produced during flowering period 5. *ochroleucus*
- HH. Bulb and neck inclusive 9-14 cm. long; perianth 6-7 cm. long, yellow:
- K. Perianth-lobes about 6-8 mm. long, leaves 0.5-1 cm. broad 7. *attenuatus*.
- KK. Perianth-lobes about 1.5 cm. long; leaves 1-2 cm. broad, obtuse 8. *Flanagani*.
- FF. Perianth-tube very slender, slightly constricted at the throat, lobes becoming recurved, flower yellow 9. *stenanthus* var. *major*.
- EE. Flowers with red as predominating colour:
- L. Perianth-tube very slender, constricted at the throat; lobes spreading or recurved 9. *stenanthus*.
- LL. Perianth-tube dilated fairly evenly from the base; lobes usually somewhat connivent:
- M. Perianth 2.5-3 cm. long; lobes 5-6 mm. long ... 10. *parviflorus*.
- MM. Perianth 2.5-3 cm. long; lobes 1-1.2 cm. long 18. *bicolor*.
- MMM. Perianth 3.75-5 cm. long; lobes 6-9 mm. long 23. *Tuckii*.
- LLL. Perianth-tube dilated evenly from the base to the throat; lobes spreading or reflexed:
- N. Inner perianth-lobes subglobose, rotund or shortly oblong, less than 8 mm. long (see also *C. rectiflorus*):
- O. Peduncle or scape solid, perianth-lobes widely spreading or revolute:
- P. Leaves 5-7 mm. broad 11. *suaveolens*.
- PP. Leaves about 1.7 cm. broad 12. *rotundilobus*.
- OO. Peduncle hollow (fistulose):
- Q. Perianth-tube rarely more than 5 mm. wide at the throat; leaves less than 1 cm. broad; plants growing in open veld:
- R. Perianth-lobes spreading 13. *O'Brieni*.

- RR. Perianth-lobes ultimately spreading-reflexed 14. *Macowani*.
- QQ. Perianth-tube about 8 mm. wide at the throat, lobes spreading reflexed, leaves 1-2 cm. broad, plants growing on trees or rocks with roots embedded in moss 15. *epiphyticus*.
- NN. Inner perianth-lobes oblong or oblong-lanceolate, 1-3 cm. long:
- S. Leaves 2.5-4 cm. broad, 50-60 cm. long; perianth 3.5-4.5 cm. long, lobes 1-1.5 cm. long, spreading 17. *Huttoni*.
- SS. Leaves rarely up to 2 cm. broad and usually less than 40 cm. long or not present at time of flowering:
- T. South African species (but see also Trop. Afr. spp.):
- U. Perianth usually less than 4 cm. long.
- V. Perianth 2.5-3 cm. long, tube as long or somewhat longer than the lobes; leaves absent or one produced during flowering period 18. *bicolor*.
- VV. Perianth up to 2.5 cm. long; tube somewhat longer than the oblong-lanceolate lobes 19. *brachyscyphus*.
- VVV. Perianth 2.5-3 cm. long; tube twice as long as the oblong lobes ... 20. *rectiflorus*.
- VVVV. Perianth 3.5-4 cm. long, tube 4-5 times as long as the oblong lobes 21. *Junodii*.
- UU. Perianth 4.5-6.5 cm. long; lobes about 1 cm. long.
- W. Perianth lobes broadly oblong-elliptic, rose scarlet 16. *rhododactylus*.
- WW. Perianth-lobes ovate, red 25. *angustifolius*.
- WWW. Perianth-lobes ovate, tube red with yellow stripes 26. *striatus*.
- UUU. Perianth 4.5-8 cm. long, rarely less; lobes 1.5-3 cm. long:
- X. Perianth about 4.5 cm. long, pale red; lobes about 1.75 cm. long, 6-7 mm. broad 27. *pallidus*.
- XX. Perianth 5-6 cm. long, bright red, lobes about 1.5 cm. long, narrowly oblong 28. *odorus*.
- XXX. Perianth 6.25-7.5 cm. long, "lobed about half way down," somewhat asymmetrical, "coral red" 29. *inaequalis*.
- XXXX. Perianth 6-8 cm. long, "brilliant red," lobes 2-3 cm. long 30. *Fergusoniae*.
- TT. Tropical African species (possibly extending into Zululand):
- Y. Perianth 3.5-4.5 cm. long, lobes narrowly oval, about 1 cm. long; leaves undescribed 22. *rhodesianus*.

- YY. Perianth 3-3.75 cm. long, lobes oblong-lanceolate, rather shorter than the tube, leaves contemporary with the flowers23. *Welwitschii*.
- LLLL. Perianth-tube narrow for a short distance at the base, inflated above (not evenly dilated from base to throat) contracted or not at the throat:
- Z. Leaves flat or slightly grooved above and keeled below:
- A'. Perianth-tube smooth, red; perianth 6.5-7.5 cm. long31. *contractus*.
- A'A'. Perianth-tube smooth, the typical form with six whitish lines extending along the perianth; perianth about 5 cm. long32. *collinus*.
- A'A'A'. Perianth tube fluted:
- B'. Perianth 5-5.5 cm. long, lobes 1.5-1.75 cm. long; style hardly lobed at the apex33. *ventricosus*.
- B'B'. Perianth 4.5-5 cm. long, lobes about 1 cm. long; style trifid34. *staadensis*.
- ZZ. Leaves spirally twisted, perianth 4-7 cm. long, lobes about 1-5 cm. long35. *spiralis*.
- AA. Flowers 1-2, rarely 3:
- C'. Perianth-tube slender, trumpet shaped:
- D'. Perianth lobes about 2 cm. long, 0.9-1.2 cm. broad, flowers cream36. *leucanthus*.
- D'D'. Perianth lobes 4.3 cm. long, 1.9 cm. broad, flowers crimson37. *Guthrieae*.
- C'C'. Perianth tube slender at the base, amply dilated above to the throat, upper portion more or less bell-shaped:
- E'. Flowers white or shell pink with dark stripes down the back of the lobes:
- F'. Leaves not twisted, 1-3 mm. broad; perianth 4-6 cm. long38. *clavatus*.
- F'F'. Leaves spirally twisted:
- G'. Perianth 4.5-6.5 cm. long; leaves 3.5 mm. broad39. *helictus*.
- G'G'. Perianth 8-10 cm. long; leaves 5-8 mm. broad40. *Smithiae*.
- E'E'. Flowers red or dark pink:
- H'. Leaves 3-5 mm. broad, perianth about 3 cm. long, narrow basal portion of tube 5 mm. long41. *Thorncroftii*.
- H'H'. Leaves 3-5 mm. broad, perianth 5-8 cm. long, narrow basal portion of tube 1.2-2 cm. long42. *Galpini*.
- H'H'H'. Leaves 1-2 cm. broad, perianth 7.5-10.5 cm. long43. *sanguineus*.
- AAA. Flowers several in an umbel; pedicels short, basal portion of tube long and slender, abruptly dilated above, flowers pink with dark stripes extending down the backs of the lobes44? *vittatus*.

DESCRIPTION OF THE SPECIES

1. *C. OBLIQUUS* (Linn. f.) Ait. Hort. Kew, 1, 414 (1789).

Description.—*Bulb* subglobose, up to about 10 cm. in diameter, contracted into a neck above ground, covered with chestnut tunics, occasionally budding from the base into clumps of 3 or 4. *Leaves* 4-12 from a bulb, contemporary with the flowers, distichous, strap-shaped, 20-60 cm. long, 3-6 cm. broad, obtuse, twisted towards the apex. *Peduncle* 20-60 cm. tall, 1.3 cm. in diameter at the base, hollow. *Spathe-valves* ovate-oblong, acuminate, 3 cm. long, 1 cm. broad. *Pedicels* up to 2 cm. long, recurved. *Flowers* 6-12 in an umbel, pendulous; *perianth* about 7 cm. long, yellow and red or yellowish green tinged with red, or red on the tube passing into green on the lobes; *tube* straight or slightly curved at the base, dilated to a throat about 2 cm. wide, about 4.5 cm. long; *lobes* about 2.5 cm. long, and 1.5 cm. broad. *Stamens* in one row towards the base of the perianth-tube; filaments 3 cm. long. *Style* nearly equalling the perianth in length, slightly trifid at the apex. (Pl. 137, I.)

Distribution.—Cape Province, Knysna district and eastwards through the native territory of the Transkei into Natal.

Notes.—This species has been figured in several of the famous early botanical works and is certainly one of the most striking members of the genus. When writing the text accompanying plate 391 in "*Natal Plants*," Medley Wood noted the following differences from Baker's description in "*Flora Capensis*:" leaves straight, not falcate, contemporary with, not produced after the flowers, perianth straight or nearly so, stamens equal, not biseriate, the stigma three-lobed, not capitate, etc. Harry Bolus confirmed Medley Wood's identification of *C. obliquus*. Baker may have had reasons for his statements about the leaves but in nature they are certainly contemporary with the flowers. Herbert recorded them as persistent. But Baker's statements concerning the stamens and stigma are misleading as they are also in his description of *C. carneus* Lindl.

The distribution of *C. obliquus* from Knysna district into Natal is intermittent. It may be found fairly abundantly in rocky grassveld areas, often with the bulbs wedged between rocks. It was first brought into cultivation about 1874 by Masson, a Kew gardener, who made a joint botanical excursion with the Swedish botanist Thunberg into the eastern Cape Province in 1873.

2. *C. CARNEUS* Lindl. in Bot. Reg. t. 1462 (1831).

Description.—*Bulb* subglobose, 6-10 cm. in diameter, contracted into a neck above ground, covered with chestnut tunics. *Leaves* 8-10, apparently either persistent or deciduous and produced after the flowers, distichous, strap-shaped, about 45 cm. long 3-3.75 cm. wide, obtuse, twisted at maturity. *Peduncle* 30 cm. or more tall, glaucous, sometimes twisted. *Spathe-valves* 3-4, lanceolate, 3.5-5 cm. long. *Pedicels* 1.5-2.5 cm. long. *Flowers* 5-10 in an umbel, pendulous; *perianth* 6-7.5 cm. long, pink, paler towards the base; *tube* curved at the base dilated to the throat about 1 cm. wide, 4-5 cm. long; *lobes* elliptic-oblong, about 1.5 cm. long, 7.5-9 mm. broad. *Stamens* inserted in the middle of the perianth-tube; filaments about 2.5 cm. long. *Style* about equal to the perianth in length; stigma shortly three-lobed. (Pl. 137, II.)

Distribution.—Cape Province, Bredasdorp and Caledon districts.

Notes.—This species was introduced into cultivation later than *C. obliquus*. It was figured and described for the first time under t. 1462 of the *Botanical Register*. No definite native locality record was then known but specimens agreeing very closely with the type figure are recorded from sand-dunes near Elim.

Baker follows Lindley's description in most respects but departs from it in important details, for example he states that the stamens are inserted low down in the perianth tube (*C. obliquus* character) as against stamens inserted "into the middle of the tube," and stigma capitate instead of shortly three-lobed. As stated earlier I have not examined the specimens cited by Baker but I doubt very much whether the specimen cited from Alexandria Division (*C. obliquus* distribution) be-

longs to *C. carneus*. In this may be the explanation of the discrepancies in his description from that of Lindley. Both Lindley and Baker state that the leaves appear after the flowers, whereas Herbert, six years later than Lindley, included it in the section with persistent leaves: It is quite possible that bulbs under different conditions will react differently in the matter of leaf production.

3. *CYRTANTHUS FALCATUS* sp. nov.¹

Description.—*Bulb* ovoid, 5-8 cm. in diam. contracted into a neck 8-12 cm. long, densely covered with membranous tunics. *Leaves* usually 4, contemporary with flowers or produced during flowering period, falcate, evenly narrowed to the apex, about 25 cm. long 2-3 cm. broad, leathery. *Peduncle* 25-30 cm. tall, recurved and somewhat flattened just below the umbel, making the whole umbel pendulous. *Spathe-valves* about 4, oblong-or linear-lanceolate, the largest up to 5 cm. long and 1.25 cm. broad. *Pedicels* about 1 cm. long. *Flowers* 6-10 in an umbel, pendulous; *perianth* about 6 cm. long, red, evenly dilated from the base to a throat about 1 cm. wide; *tube* 4 cm. long; *lobes* more or less obovate-oblong, about 2 cm. long and 1.25 cm. broad, the outer three with an inflexed apiculus with a few hairs. *Stamens* uniseriate or very indistinctly biseriate, inserted at the throat of the perianth-tube; *filaments* exserted, about 1.25 cm. long. *Ovary* oblong, becoming oblong-elliptic. *Style* slightly shorter than the perianth, trifid. (Pl. 138, I.)

Distribution.—Natal; Impendhle district, on the Inzinga River among rocks; also at Howick but no exact information available.

Notes.—The first herbarium record I have of this species is an inflorescence in the Natal Herbarium. This was preserved in November 1905 from a plant in the Durman Botanical Gardens originally collected by J. Wylie. The original locality is, unfortunately, not recorded on the specimen sheet. In September 1932 Mrs. K. W. Anderson collected it at Inzinga in the Impendhle district and Mrs. A. C. Carter obtained it in the same locality in 1936. A collection by Mr. R. E. Symons at Howick is without date or exact locality records.

When Mrs. Carter forwarded her plant to the Natal Herbarium in 1932, Miss H. M. L. Forbes, then stationed there, suspected that it represented an undescribed species, and she has kindly handed over the duties of description to me.

C. falcatus is obviously most nearly related to *C. obliquus* and *C. carneus*. The recurved peduncle illustrated in the accompanying figure is, however, unique in the genus, and the broad falcate leaves are also very distinctive, hence the name of the species.

4. *C. FLAVUS* Barnes in S. Afr. Gardening & Country Life, 21, p. 77 (1934); Fl. Pl. S. Afr. 14, t. 559 (1934).

Description.—*Bulb* subglobose, 0.5-1.3 cm. in diam., produced into a neck about 1 cm. long. *Leaves* 1-2, contemporary with the flowers, linear, 7-15 cm. long, 1-1.5 mm. broad. *Peduncles* 1-2 from each bulb, slender, 20-25 cm. high, 2-3 mm. in diam. *Spathe-valves* linear-lanceolate or linear acuminate, about 2 cm. long. *Pedicels* 1-2.5 cm. long. *Flowers* usually 2-3, rarely up to 5 in an umbel, suberect, canary yellow; *perianth* 2 cm. long; *tube* broadest at the middle; *lobes* slightly converging, $\frac{1}{2}$ the length of the tube. *Stamens* biseriate, very short, well included. *Style* nearly as long as the perianth, trifid. *Capsule* globose or oval, 1-1.5 cm. long. (Pl. 138, III.)

¹ 3. *Cyrtanthus falcatus* sp. nov., affinis *C. obliquo* Ait. et *C. carneo* Lindl. pedunculo apicem versus cernuo foliis falcatis facile distinguitur.

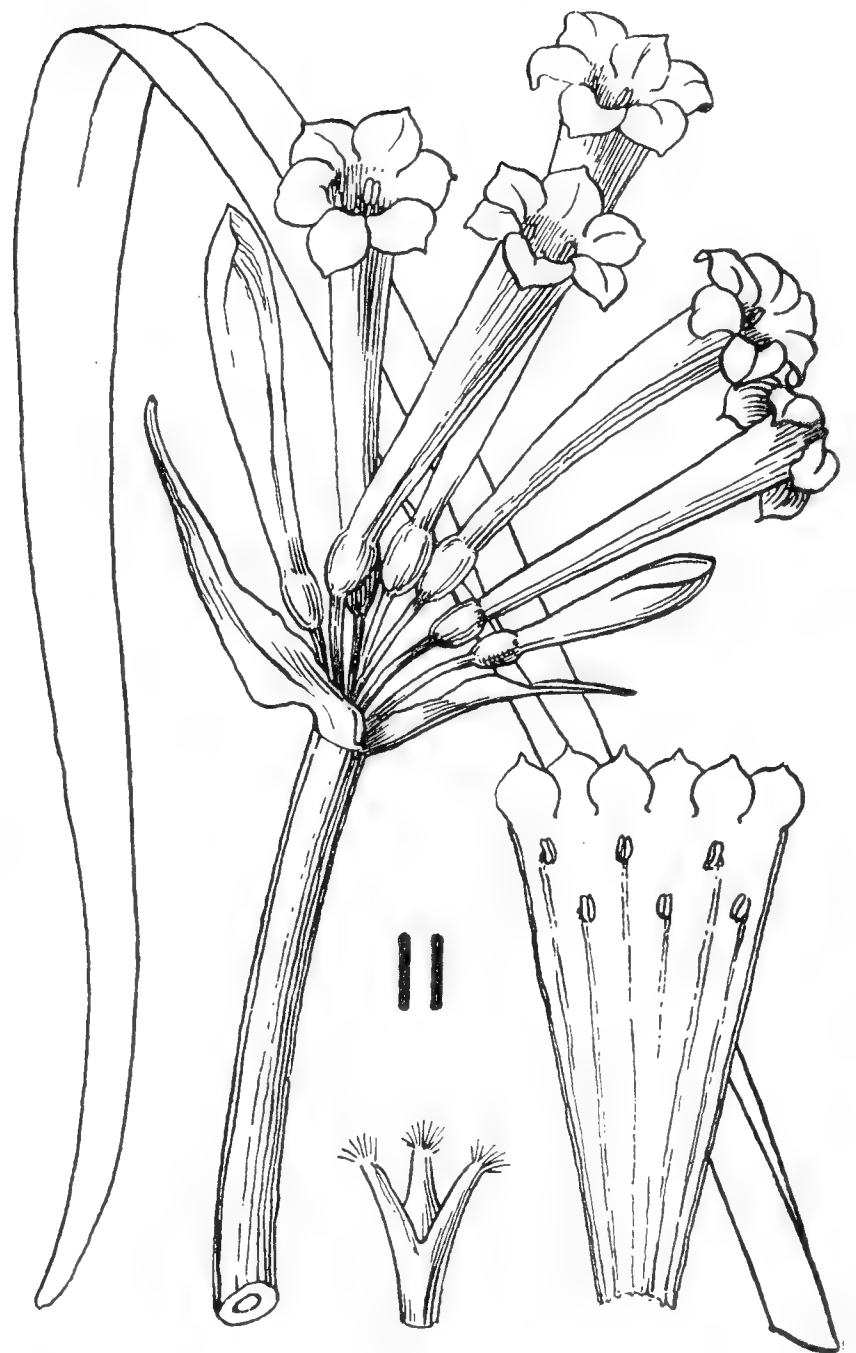
Bulbus ovoideus, 5-8 cm. diametro, in collo 8-12 cm. longo productus, brunneus. **Folia** 4, synantha, falcata, circiter 25 cm. longa, 2-3 cm. lata. **Pedunculus** 25-30 cm. longus, apicem versus compressus et cernuus. **Bracteae** circiter 4, oblongo—vel lineari—lanceolatae usque ad 5 cm. longae et 1.25 cm. latae. **Pedicelli** circiter 1 cm. longi. **Umbella** 6-10-flora; flores penduli; perianthium circiter 6 cm. longum, rubrum; tubus 4 cm. longus, superne gradatim ampliatus; lobi plus minusve obovato-oblongi, circiter 2 cm. longi, 1.25 cm. lati. **Stamina** uniseriata, ad faucem perianthii inserta, filamentis exsertis. **Ovarium** oblongum; stylus tubo perianthii exsertus, trifidus.

Distribution.—Natal; Impendhle district, Inzinga, Sept., Carter in Natal Herb. 30339 (type); among rocks at waterfall on Inzinga River, Sept., Anderson in Natal Herb. 22186; Howick, Symons in Nat. Herb. Pretoria, 24804.



I, *Cyrtanthus obliquus* Ait. (After Fl. Pl. S. Afr. T 35); II, *C. carneus* Lindl. (After Bot. Reg. t. 1462)

See page 75



See pages 75 and 79
 I, *Cyrtanthus falcatus* sp. nov., R. A. Dyer; II, *C. Mackenii* Hook. f. (After Fl. Pl. S. Afr. t. 33); III, *C. flavus* Barnes (After Fl. Pl. S. Afr. t. 559); IV, *C. Mackenii* var. *Cooperi* R. A. Dyer (After Bot. Mag. t. 5374).
 Plate 138

Distribution.—Cape Province; Bathurst district, Trappes Valley, abundant in small area.

Notes.—Our knowledge of *C. flavus* is limited to the type collection by Mrs. D. Hoole in 1930. It is remarkable for its small, suberect, bright yellow flowers, widest about the middle. Although it was found in moderate abundance in a small marshy area of sandy soil in Trappes Valley, it has not been recorded elsewhere. It is closely allied to the red-flowered *C. parviflorus* Baker.

5. *C. OCHROLEUCUS* (Herb.) Burch. ex Steud. Nom. ed. 2, 1. 475 (1840). *Monella ochroleuca* Herb. App. 29 (1821). *Cyrtanthus lutescens* Herb. Amaryllid. 129, t. 33, fig. 14 (1837); Baker in Fl. Cap. 6, 225 (1896).

Description.—*Bulb* globose, 2-2.5 cm. in diam. with a short neck. *Leaves* apparently produced after the flowers, linear or filiform, 1-2 mm. broad. *Peduncle* 15-30 cm. tall, slender, hollow. *Spathe-valves* 2, linear-lanceolate, 2-2.5 cm. long. *Pedicels* usually much shorter than the spathe-valves. *Flowers* 2-4 in an umbel, suberect; *perianth* 4-5.25 cm. long, very slightly curved, light yellow or yellowish white; *tube* dilated gradually from the base to a throat 5-7 mm. wide; *lobes* oblong, up to 1 cm. long, spreading. *Stamens* biseriate, included. *Style* exserted from the tube, very shortly trifid.

Distribution.—Cape Province; Riversdale and probably neighboring districts on the mountains at about 1500 ft. alt. and possibly extending to the eastern Cape.

Notes.—In classifying the plants included by Baker in "*Flora Capensis*" under *C. lutescens* and his variety *Cooperi*, the conclusion was arrived at that more than one species was included. The Galpin specimen, no. 654, cited by Baker, has been placed under *C. stenanthus* as var *major*. I was unable to distinguish specifically the typical form of *C. lutescens* var *Cooperi* from *C. Mackenii*. Therefore, left with the choice of regarding *C. Mackenii* also as a variety of *C. lutescens* or transferring *C. lutescens* var *Cooperi* Baker from *C. lutescens* to a variety of *C. Mackenii*, I have adopted the second alternative. It will be noted, however, that the name *C. lutescens* has to give place to the earlier name, *C. ochroleucus* Burch.

6. *C. MACKENII* Hook. f. in Gard. Chron. 1869, p. 641.

Description.—*Bulb* ovoid 2.5-4 cm. in diam. contracted into a neck and budding from the base. *Leaves* 2-6, contemporary with the flowers, linear, 20-30 cm. long, 0.5-1 cm. broad. *Peduncle* usually somewhat longer than the leaves, somewhat glaucous, hollow. *Spathe-valves* 2, lanceolate, 2.5-3.75 cm. long, green, spotted with red-brown when young. *Pedicels* in flower much shorter than the spathe-valves. *Flowers* 4-10 in an umbel, suberect; *perianth* about 5 cm. long, pure white or white with yellowish throat; *tube* slightly curved, 3.5-4.3 cm. long, dilated gradually from the base to a throat about 5 mm. wide; *lobes* ovate-oblong, 6-7 mm. long, 5-6 mm. broad. *Stamens* biserate, included; filaments very short. *Style* exserted, trifid, minutely bristly on the tips. (Pl. 138, II.)

Var *COOPERI*. *new comb.*; *C. lutescens* Hook. in Bot. Mag. t. 5374 (1863) non Herb.; *C. lutescens* Herb. var. *Cooperi* Baker Handb. Amaryllid. 58 (1888). Flowers yellow or cream. (Pl. 138, IV.)

Distribution.—Natal, moist places from Port Shepstone to Isipingo, never very far from the coast; var. *Cooperi*; Natal, Port Shepstone growing with the typical form and extending inland along valleys of southern Natal and of the eastern Cape to the mountain ranges.

Notes.—It will be observed from the synonymy above, that the variety *Cooperi* was formerly associated with *C. ochroleucus* Burch. (*C. lutescens* Herb.). Whether or not I am justified in dissociating the two forms is open to question. I am convinced, however, that the *C. lutescens* of Hooker in Bot. Mag. t. 5374 is not specifically distinct from *C. Mackenii*. Hook. f.

C. Mackenii commonly known as "Ifafa-lily" from the native name of the type locality, has been figured in several botanical works, probably the latest being Fl. Pl. S. Afr. t. 33 (1921).

It is generous under suitable conditions of cultivation. If grown in a moist situation it increases readily and flowers for a considerable period each year. In addition to the yellow or cream variety one sees occasionally in cultivation, plants whose flowers are suffused with pink. How they originated is not recorded.

7. *CRYTANTHUS ATTENUATUS* *sp. nov.*²

Description.—*Bulb* ovoid, 2.5-6 cm in diam. contracted into a neck 5-7 cm. long, covered with membranous tunics. *Leaves* 3-4, *contemporary* with the flowers, more or less linear, about 40 cm. long 0.5-1 cm broad, narrowed gradually to both ends. *Peduncle* 40-50 cm. tall apparently hollow. *Spathe-valves* 2, lanceolate, 4-5 cm. long. *Pedicels* 0.5-2 cm long. *Flowers* 6-9 in an umbel, suberect; *perianth* 6-7 cm. long, comparatively slender yellow; *tube* 5.5-6.5 cm. long very slender, gradually dilated to the throat 6-7 mm wide; *lobes* suborbicular, 6-7 mm. long, about 5mm broad, the outer 3 with an inflexed apiculus. *Stamens* biseriate with short filaments, extending to the throat of the perianth-tube. *Ovary* oblong. *Style* trifid. (Pl. 139,I.)

Distribution.—Basutoland; Leribe, damp slope near rocks.

Notes.—The specimens collected by Madame Dieterlen in 1910 have hitherto been considered forms of *C. Mackenii* var *lutescens* (*C. lutescens* var *Cooperi* Baker.) but they differ in the larger bulbs, generally taller habit and in the longer and comparatively narrow perianth tube. It also bears a strong likeness to *C. Flanaganii*, which, however, is more robust in all respects and more showy. There is little doubt that *C. attenuatus* has a wider distribution than the neighborhood of Leribe in Basutoland but such haunts on the mountain ranges in which one would expect to find it are unfrequented by botanical collectors.

8. *C. FLANAGANI* Baker in Fl. Cap. 6, 532 (1897).

Description.—*Bulb* 3 cm. in diameter extended into a neck up to 11 cm. long, budding from the base. *Leaves* up to 4, contemporary with the flowers, up to 20 cm. long or probably more at maturity, 1-2 cm. broad, narrowly strap-shaped, somewhat falcate, obtuse. *Peduncle* about 20 cm. long, somewhat compressed. *Spathe-valves* 2, lanceolate, up to 5 cm. long and 1.1 cm. broad, white with red veins. *Pedicels* up to 2.5 cm. long, green. *Flowers* 4-7 in an umbel, suberect; *perianth* 6-7 cm. long, yellow; *tube* narrowly trumpet-shaped, dilated from 1 mm. at the base to 6 mm. at the throat, 4-5.5 cm. long; *lobes* oblong, spreading, 1.5 cm. long, 8-9 mm. broad, the outer three slightly broader than the inner ones. *Stamens* biseriate, inserted near the mouth of the perianth-tube, included. *Style* slightly exserted, three-lobed. (Pl. 139,II.)

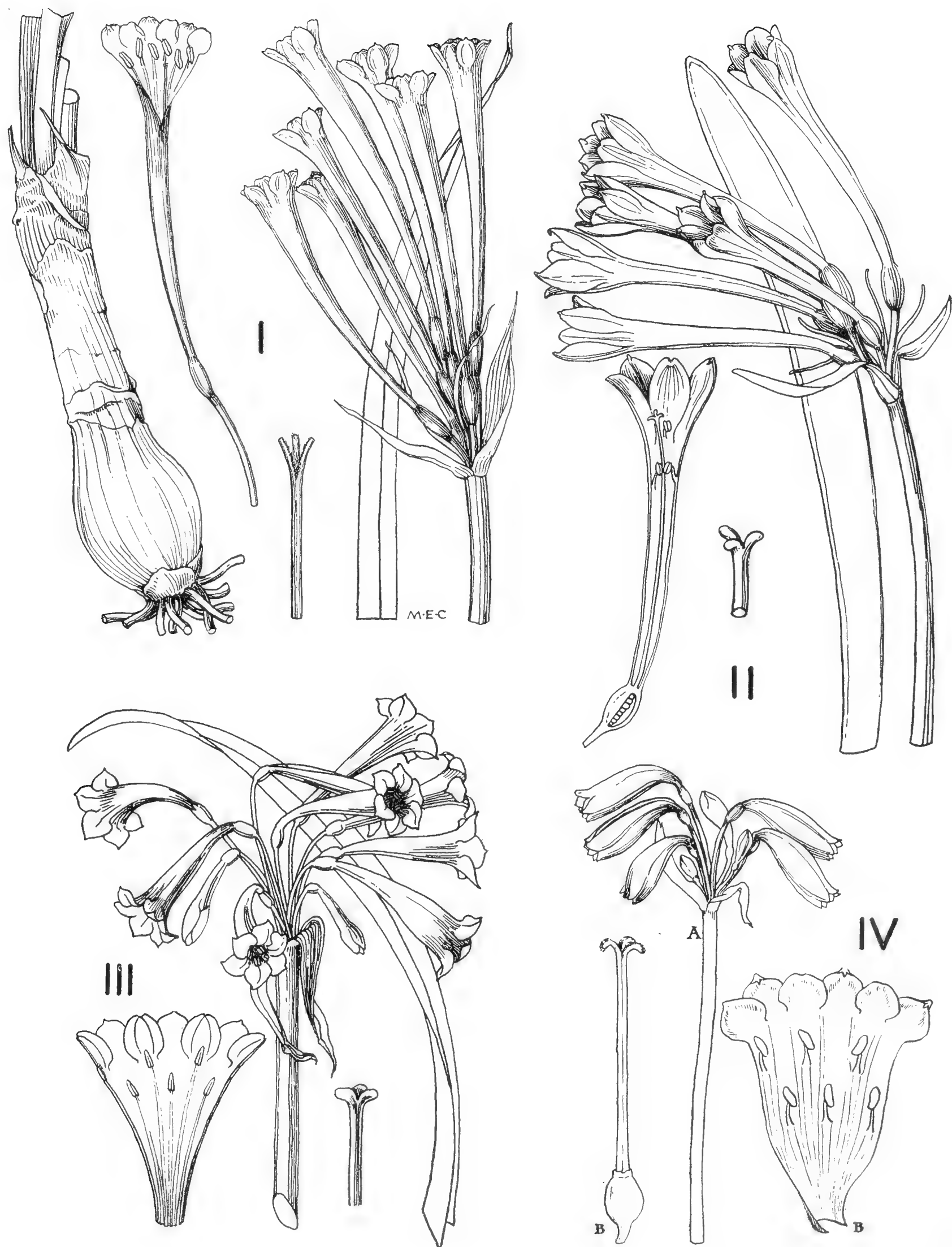
Distribution.—On the mountains of the eastern Cape Province in the Transkei area, extending along the Drakensberg to Mont Aux Sources on the Natal border.

Notes.—It was not until this species was investigated by Miss I. C. Verdoorn for "Flowering Plants of South Africa" t. 693 (1938), that this species became properly understood. Baker recorded the colour of the flower as white. Although Flanagan,

²*Cyrtanthus attenuatus* *sp. nov.*, affinis *C. Mackenii* var. *Cooperi* R. A. Dyer bulbo majore pedunculo et follis longioribus perianthio longiore differt.

Bulbus ovoideus, 2.5-3cm. diametro in collo 5-7cm. longo productus. **Folia** 3-4 synantha, plus minusve linearia, circiter 40 cm. longa 0.5-1 cm lata. **Pedunculus** 40-50 cm. longus. **Bracteae** 2, lanceolatae, 4-5cm. longae. **Pedicelli** 0.5-2cm longi. **Umbella** 6-9-flora; flores suberecti; **perianthium** 6-7cm. longum, luteum; **tubus** 5.5-6.5cm. longus, attenuatus, superne gradatim ampliatus, fauce 6-7mm. lato; **lobi** suborbiculati, 6-7mm. longi et circiter 5mm. lati. **Stamina** biseriata filamentis brevibus. **Ovarium** oblongum 0.5-1cm. longum; stylus tubo perianthii breviter exsertus, trifidus.

Distribution: Basutoland; Leribe, slope near a damp rock, Nov., Dieterlen 830 in South African Museum (type), National Herbarium, Pretoria, and Natal Herbarium.



See pages 80, 83 and 84

I, *Cyrtanthus attenuatus* sp. nov., R. A. Dyer; II, *C. Flanagani* Baker (After Fl. Pl. S. Afr. t. 693); III, *C. rotundilobus* (After Fl. Pl. S. Afr. t. 37); IV, *C. parviflorus* Baker (A, After Marloth Flora S. Afr. t. 34; B, After Bot. Mag. t. 7653).



I, *Cyrtanthus epiphyticus* (After Bot. Mag. t. 9252); II, *C. bicolor* sp. nov., R. A. Dyer; III, *C. huttoni* Baker (After Bot. Mag. t. 7488); IV, *C. rhododactylus* Stapf (After Bot. Mag. t. 917). See pages 85, 86 and 87. Plate 140

the collector of the type specimen, made no specific mention of the colour on the collector's label, he nevertheless gave the plant the tentative name of *C. lutescens*, indicating thereby that the flowers were yellow when collected. Taking this to be the case it has been possible to match the type in Bolus Herbarium with several specimens in other herbaria, and thus extend the distribution records.

This charming species, the largest of those with yellow flowers, has flourished in at least one garden in Pretoria, and if further stock is obtained from its native fastnesses, it would be surprising if it failed to attract widespread attention.

9. *C. STENANTHUS* Baker in Fl. Cap. 6, 532 (1897).

Description.—*Bulb* ovoid, about 2 cm. in diam. contracted into a short neck, covered with membranous tunics. *Leaves* 2-4, linear, 20-30 cm. long, 2-5 mm. broad. *Peduncle* rather longer than the leaves. *Spathe-valves* linear, 2.5-3.75 cm. long. *Pedicels* much shorter than the spathe-valves. *Flowers* 3-7 in an umbel, suberect; *perianth* about 3 cm. long, red or reddish-brown; *tube* very slender, dilated gradually from the base nearly to the throat, there slightly contracted, 2-3 mm. wide; *lobes* ovate, about 3 mm. long. *Stamens* biseriate, inserted in the perianth-tube; anthers sessile. *Style* trifid.

VAR. MAJOR R. A. Dyer n. var³; perianth 4-4.5 cm. long; yellow.

Distribution.—Basutoland; slopes of Mont Aux Sources between 6000-8000 ft. alt. and in neighboring territory of the Cape Province, Natal and extending into the Transvaal; var. *major*; Transvaal, eastern grassveld in damp places.

Notes.—*C. stenanthus* is remarkable for its exceptionally narrow perianth-tube which has a collar-like constriction at the throat. Flowers have been recorded as "red," "reddish-brown," or "purple with green."

The variety *major* was at one time confused with *C. ochroleucus* (*C. lutescens*) by Baker, from which it is distinguished by the narrower perianth-tube and its collar-like contraction at the throat. It is found occasionally in damp places in the eastern Transvaal.

10. *C. PARVIFLORUS* BAKER in Gard. Chron. 1891, p. 104.

Description.—*Bulb* ovoid-oblong, about 2 cm. in diam. *Leaves* 3-6, contemporary with the flowers, linear, straight, bright green, 30 cm. long. *Peduncle* about as long as the leaves. *Spathe-valves* lanceolate, 2.5-3.5 cm. long. *Pedicels* not longer than the spathe-valves. *Flowers* 6-12 in an umbel; *perianth* 2.5-3 cm. long, bright red; *tube* slightly curved and slender at the base, dilated to about 5 mm. at the throat; *lobes* oblong, 5-6 mm. long, not at all spreading. *Stamens* biseriate, included. *Style* reaching to the tips of the segments, trifid. (Pl. 139, IV.)

Distribution.—Cape Province; mountains of the eastern Cape extending into Natal.

Notes.—This is, as the name implies, one of the smallest-flowered species in the genus, yet it is not unattractive. It has been figured both in *Curtis's Botanical Magazine* t. 7653 and by Marloth in his *Flora of South Africa* vol. 4. 1915. The closest relationship is with *C. O'Brieni* Baker.

11. *C. SUAVEOLENS* SCHONL. in Rec. Alb. Mus 3, 62 (1914), *C. Stayneri* L. Bolus in Ann. Bolus Herb. 4, 28 (1925).

Description.—*Bulb* about 2 cm. in diam. not sharply distinguished from the neck, 1-3 cm. long. *Leaves* 2-3, contemporary with flowers linear, obtuse 15-20 cm. long, about 5 mm. wide, keeled on the lower surface, subglaucous. *Peduncle* about equalling the leaves, *solid*, glaucous. *Spathe-valves* lanceolate, 2.5 cm. long. *Pedi-*

³Var. nov. periantho 4-4.5 cm. longo luteo distinguitur. *C. lutescens* var. *Cooperi* Baker in Fl. Cap. 6, 255 (1896) in part. Galpin—no. 654.

cels shorter than the spathe-valves. *Flowers* 3-4 in an umbel, suberect to pendulous, dusky (cherry) red with a strong scent of cloves (Brownlee) (blood red Stayner); *perianth* about 3.7 cm. long; *tube* dilated gradually to a throat about 3-4 mm. wide; *lobes* broadly ovate, obtuse, 3-4 mm., long reflexed. *Stamens* biseriate, subsessile, included. *Style* slightly exserted, trifid.

Distribution.—Eastern Cape Province; King Williams Town district, on the Perie and adjacent Mountains.

Notes.—The collector of the type specimen, Dr. J. Brownlee, remarked in a letter on the unusual feature of the solid peduncle, an observation omitted from the published description. A solid peduncle is also recorded for *C. rotundilobus*, a slightly larger species from the Transkei. (see also note under *C. rhodesianus* Rendle, No. 21.)

The bulbs, which produced the type material of *C. Stayneri*, which I have here considered as equal to *C. suaveolens*, were forwarded from King Williams Town by Capt. F. J. Stayner to the National Botanic Gardens, Kirstenbosch in 1921, where they flowered in November, two years later. It is of interest to repeat the salient points of the original description. These are as follows:

Leaves 4, more or less erect, recurved towards the apex, linear narrowed towards the base and apex, 24.5 cm. long, 0.7 cm. wide, canaliculate above, keeled on the lower surface; the keel consisting of three subprominent nerves; the margin somewhat recurved and thickened. *Peduncle* pink, conspicuously nerved, 23 cm. long, about 5 cm. diam. at the base. *Spathe-valves* oblong-lanceolate, about 3 cm. long. *Pedicels* 1-1.9 cm. long. *Flowers* 5 in an umbel, dull red, with the lobes dull green; *perianth* 2.8-3.1 cm. long, curved, gradually widened to the throat, 6-7 mm. wide; *lobes* decidedly recurved or subrevolute, broadly ovate, obtuse, the 3 outer with an apiculus with hairs, 5 mm. long, 4.5 mm. broad, the inner ones slightly shorter and narrower. *Stamens* biseriate, the lower row 5 mm. and the others 1 mm. within the throat, filaments very short. *Style* about equalling the tube in length.

The close similarity of the two type specimens and the proximity of the type localities leaves little doubt that only one species is involved.

12. *C. ROTUNDILOBUS* N. E. Br. in Fl. Pl. S. Afr. I. t. 37 (1921.)

Description.—*Bulb* ovoid, 3 cm. in diam. produced into a neck about 3 cm. long. *Leaves* up to 4, contemporary with the flowers, linear, tapering to both ends, channelled above, keeled below, 16-30 cm. long, about 1.7 cm. broad. *Peduncle* about 14 cm. long, arising at the side of the leaves, solid. *Spathe-valves* ovate, acuminate, 2.5 cm. long. *Pedicels* up to 3 cm. long. *Flowers* about 11, in an umbel, reddish-scarlet; *perianth* 3 cm. long; *tube* 2.5 cm. long, more or less trumpet shaped, gradually dilated to a throat about 6 mm. wide; *lobes* suborbicular, 5 mm. long, 5 mm. broad, widely spreading. *Stamens* biseriate, inserted near the throat of the perianth-tube, subsessile. *Style* included, trifid. (Pl. 139, III.)

Distribution.—eastern Cape Transkei.

Notes.—This plant is said to be called the "Red-Dobo-lily" in the Transkei, for some reason unexplained. Its scientific name refers to the shape of the perianth lobes. In the description of the type this is said to have a solid peduncle which is most unusual for the genus, but is found also in *C. suaveolens*, from which it differs among other things in its more robust habit.

13. *C. O'BRIENI* Baker in Gard. Chron. 1894. 15, 716.

Description.—*Bulb* ovoid, "middle sized." *Leaves* contemporary with the flowers, 30 cm. long, 4-8 mm. broad, bright green. *Peduncle* longer than the leaves, terete. *Spathe-valves* lanceolate, 3.75 cm. long, scariose. *Pedicels* considerably shorter than the spathe-valves. *Flowers* 7-8 in an umbel, nodding; *perianth* 3.75 cm. long or more, bright pale scarlet; *tube* curved, dilated gradually to a throat about 4.5 mm. wide; *lobes* ovate 4-5 mm. long. *Stamens* and style included within the perianth tube.

Distribution.—Natal; extending along the Drakensberg into the eastern Cape about 5000-6000 ft. alt. in crevices of rocks.

Notes.—Bulbs of this plant were first imported into England by J. O'Brien from Medley Wood of Durban. It was said of O'Brien (*Gard. Chron.* 1892) after whom the species was named, that he was remarkable for his "success in flowering all kinds of rare Cape Plants."

With herbarium material to work with, I find it difficult to distinguish between *C. O'Brieni*, *C. Macowani*, and some forms of *C. parviflorus*. The characters employed in the key are differences mainly derived from a comparison of the original descriptions. *C. O'Brieni* appears to be a connecting link between the other two species.

14. *C. MACOWANI* Baker in *Gard. Chron.* 1875, 4, 98.

Description.—*Bulb* ovoid, 2.5 cm. diam. *Leaves* 1-3, contemporary with the flowers, linear, 15-30 cm. long, 3-7 mm. broad. *Peduncles* slender, about 30 cm. long, purplish. *Spathe-valves* 2, lanceolate, 2.5-3.75 cm. long, greenish. *Pedicels* up to about 2 cm. long. *Flowers* 6-8 in an umbel, nodding; *perianth* 3.5-4 cm. long, bright scarlet; *tube* curved, dilated gradually from the base to a throat 4-5 mm. wide; *lobes* broadly ovate or oblong, 5-7 mm. long, spreading. *Stamens* distinctly biseriate; filaments very short, the upper three anthers in the throat. *Style* slightly exserted, tricuspidate.

Distribution.—Cape Province; Fort Beaufort district on the Winterberg Mtn., extending northwards and eastwards in grassveld on the mountains in the Somerset East, Graaff Reinet and Murraysberg districts.

Notes.—It is difficult to differentiate between this species and *C. O'Brieni* and the latter may well be unworthy of specific distinction. *C. Macowani* extends some distance into the Karoo area but does so in mountainous grassveld habitats where conditions are not excessively arid.

15. *C. EPIPHYTICUS* J. M. Wood, in *Kew Bull.* 1913 p. 182; *Bot. Mag.* t. 9252 (1929).

Description.—*Bulb* oblong, 3-3.5 cm. in diam. with an elongated neck in all 9-11 cm. long, with dark chestnut-brown membranous tunics. *Leaves* usually 2, contemporary with flowers, flat, linear from a long narrow base and tapering to the apex, 30-50 cm. long, 1-2 cm. broad, green on the face, slightly glaucous on the back with prominent midrib. *Peduncle* subterete somewhat shorter than the leaves. *Spathe-valves* 2-3.5 cm. long. *Pedicels* 1.5-2.5 cm. long. *Flowers* 6-15 in an umbel, scarlet; *perianth* trumpet-shaped, slightly curved, 3-3.5 cm. long; *tube* gradually widened from the base to a throat 8 mm. wide; *lobes* suborbicular, obtuse, the outer ones apiculate, more or less recurved, 6-8 mm. broad. *Stamens* biseriate, unequally long, inserted about 6-7 mm. below the mouth of the corolla. *Style* filiform, shortly exceeding the anthers, shortly trifid. *Capsule* oblong, about 1.5 cm. long. (Pl. 140, I.)

Distribution.—Natal, near the East Griqualand border in the Ensikeni forests, about 3500 ft. alt.

Notes.—As the specific name implies this plant grows as an epiphyte, a remarkable feature almost without parallel in the Amaryllidaceae. It was discovered in 1912 by Mr. Walter Haygarth on branches of trees sometimes at an elevation of 20 m. (60 ft.) or more above the ground. In a letter sent to Kew the author of the species, Dr. J. Medley Wood, then Curator of the Natal Herbarium, states that it was found by Mr. Haygarth "growing on stems and branches of yellowwood trees (*Podocarpus* sp.) always in tufts of moss, which its roots penetrate, but do not, I think, even touch the bark of the tree. The only plants on the ground were a few, not many, that had been dislodged from the trees by the wind or by falling branches, and these were all still growing in the moss which had fallen with them. He also found a few growing in crevices of rocks, but again imbedded in moss."

In the account of the species accompanying the beautiful plate in "*Curtis's Botanical Magazine*," cited above, Dr. Otto Stapf repeated the suggestion that *C. epiphyticus* would do well as a basket plant embedded in moss.

Its nearest affinity is apparently *C. Macowani* Baker, from which it is distinguished by its epiphytic habit, its generally larger size and more recurved perianth lobes.

16. *C. RHODODACTYLUS* Stapf in Bot. Mag. t. 9175 (1927).

Description.—Bulb globose, 2.5 cm. in diam. with dark brown tunics, produced into a neck up to 3 cm. long. *Leaves* usually two, attaining their full length after flowering, linear, acute, flatly channelled, 16-28 cm. long, 4-10 mm. broad. *Peduncle* erect, terete, 12-15 cm. long, green or brown, purple at the base. *Spathe-valves* 2, membranous, up to 4 cm. long. *Pedicels* slender up to 2 cm. long. *Flowers* 6-8 in an umbel; *perianth* trumpet-shaped from a slender base slightly curved, 4.5-5 cm. long, up to 2.5 cm. wide across the lobes, rose-scarlet or the face of the limb incarnate; *tube* 3.5-3.75 cm. long, dilated gradually to the throat 1 cm. wide; *lobes* spreading, more or less oblong-elliptic, obtuse with a minute apiculus, 1-1.2 cm. long. *Stamens* biseriate inserted within the mouth of the perianth; filaments 3-4 mm. long. *Style* exserted about 1 cm. beyond the tube, trifid. (Pl. 140, IV.)

Distribution.—South Africa; no definite locality.

Notes.—This attractive species, described for the first time by Stapf from cultivated specimens, under plate 9175 of "*Curtis's Botanical Magazine*," has as yet, not been definitely localised. Stapf points out that it belongs to the group of species characterized by having slightly curved trumpet-shaped flowers with rather broad lobes and short filaments, among which the nearest affinity appears to be *C. epiphyticus* M. Wood. This differs in habit, has a larger ovoid-oblong bulb, more attenuated leaves and has brilliantly orange or scarlet flowers with recurved perianth-lobes. Another affinity is *C. Macowani* Baker which has smaller, strongly curved orange to orange-red flowers, with recurved or revolute perianth-lobes.

17. *C. HUTTONI* Baker, Handb. Amaryllid. 55 (1888); *C. Elliottii* Baker in Fl. Cap. 6, 220 (1896).

Description.—*Bulb* up to about 4 cm. in diam., not conspicuously contracted into a neck but the young leaf-bases progressively longer than the older ones forming a loose bulb up to 9 cm. long, increasing by budding from the base. *Leaves* 2 or 3, contemporary with the flowers, 50-60 cm. long, 2.5-4 cm. broad, tapering gradually to the apex. *Peduncle* 35-45 cm. tall, 1-1.5 cm. thick. *Spathe-valves* 2, oblong-lanceolate, up to 6 cm. long. *Pedicels* slender, nearly as long to longer than the spathe-valves. *Flowers* 12-20 in an umbel under normal conditions, nodding or often more or less pendulous on one side of the peduncle; *perianth* 3.5-4.5 cm. long, orange red to dark red; *tube* curved near the base, gradually dilated above to a throat 6-8 mm. diam., 2.5-3 cm. long; *lobes* oblong, 1-1.5 cm. long, 4-5 mm. broad, slightly spreading. *Stamens* biseriate; filaments short, slightly exserted from the tube. *Style* not as long as the perianth, trifid. (Pl. 140, III.)

Distribution.—Eastern Cape Province; on Amatola and Winterberg ranges in moist crevices near streams.

Notes.—It will be observed from the above synonymy that two of Baker's species have been merged under one name. For some years, doubt has been expressed by various workers as to whether *C. Elliottii* should be regarded as specifically distinct from *C. Huttoni*. In "*Curtis's Botanical Magazine*," under t. 7488 it is said to have been first sent to Kew by G. Hutton from the south eastern districts of the Cape Province. It may be assumed, with good reason, that Hutton collected the type material of the plant which bears his name, on the Katberg, where also the type of *C. Elliottii* was later collected.

Hutton sent bulbs to Kew where they flowered in 1864. The inflorescence was much weaker and the flowers smaller than described above, but Mr. D. G. Collett,

present S. A. Botanist at Kew, compared Baker's types at my request, and also came to the conclusion that they are not specifically distinct.

C. Huttoni is a beautiful species which should do well under cultivation. A light compost with free watering would be a near approximation of natural conditions. As is the case with other species growing naturally under moist conditions it increases by budding from the base.

18. *C. BICOLOR* sp. nov.⁴ *C. parviflorus* Baker in Fl. Cap. 6, 221 (1896) in part.

Description.—*Bulb* ovoid, 1.5-2 cm. diameter, contracted into a neck 2-4 cm. long, covered with one or two brown membranous tunics. *Leaves* absent at or produced during flowering period, linear, shorter than the peduncles, 4-5 mm. broad, gradually narrowed to the apex and base. *Peduncles* one or two from a bulb, 5-25 cm. tall, slender, 4 mm. diam., hollow. *Spathe-valves* 2, lanceolate, 3-5 cm. long, membranous. *Pedicels* slender, 1.5-5.5 cm. long, suberect. *Flowers* 3-10 in an umbel, rarely more, nodding; *perianth* narrowly funnel-shaped, 2.5-3 cm. long, very rarely only 2 cm. long, divided 1/3 or 1/2 way down, red or yellow, or intermediate shades; *tube* 1.3-1.8 cm. long, slightly curved at the base, evenly expanded to a throat 7-8 mm. diam.; *lobes* 1-1.2 cm. long, the outer three lanceolate, with a minutely pubescent incurved apiculus, inner 3 oblong or oblong-lanceolate. *Stamens* biseriate, the upper three inserted in the perianth-throat; filaments about 3 mm. long. *Style* nearly equal in length to the perianth, trilobed. (Pl. 140, II.)

Distribution.—Transvaal, eastern area including Barberton, Lydenburg and Carolina.

Notes.—The specimen in the National Herbarium, Galpin 477, selected as the type of this species, was, according to the citation in "*Flora Capensis*" referred by Baker to his species *C. parviflorus*. The comparatively long perianth-lobes in proportion to the tube readily distinguish it from this species. Judging from Baker's descriptions it appears more closely allied to his *C. brachyscyphus*. Had not Baker cited Galpin 477 under *C. parviflorus*, I should probably have placed it, and other Transvaal specimens agreeing with it, under *C. brachyscyphus*. *C. bicolor* differs from the description of *C. brachyscyphus* in that it flowers in the absence of leaves, or the leaves (apparently only one to a bulb) are produced during the flowering period, whereas Baker records 3 leaves contemporary with the flowers in his species.

Galpin records the colour of the flowers as scarlet. This is evidently not constant in the species, since, on more than one occasion specimens have been collected in the wild state ranging from red to clear yellow, the red flowers often yellow tipped or yellowish within. Dr. F. van der Merwe collected a good selection illustrating this under No. 1675. It has been collected in flower during the months between March and October.

There is a specimen in the Bolus Herbarium, No. 12362, which is allied to *C. brachyscyphus* and possibly not specifically distinct. It consists of a peduncle with 3 flowers (4 originally) and a bulb with two leaves 35 cm. long and 9 mm. broad. It may represent a connecting link between *C. brachyscyphus* and *C. bicolor* and here again is a problem to engage the attention of the field worker.

⁴*C. bicolor* sp. nov. affinis *C. brachyscypho* Baker plerumque folio uno hysterantho floribus bicoloribus differt.

Bulbus ovoideus 1.5-2 cm. diametro, in collo 2-4 cm. longo, productus, brunneus. **Folium** plerumque unum hysteranthum, lineare usque ad 15 cm. longum vel longis, 4-5 mm. latum. **Pedunculus** 5-25 cm. longus, 4 mm. diametro, fistulosus. **Bractee** lanceolatae, 3-5 cm. longae. **Pedicelli** 1.5-5.5 cm. longi suberecti. **Umbella** 3-10 flora; flores cernui; perianthium 2-3 cm. longum, rubrum, vel luteum vel rubro-luteum; tubus 1.3-1.8 cm. longus superne gradatim ampliatus: lobi 1-1.2 cm. longi, exteriores lanceolati, interiores oblongi vel oblongo-lanceolati. **Stamina** biseriata, ad faucem perianthii inserta filamentis 3 mm. longis. **Ovarium** oblongum, circiter 5 mm. longum; **stylus** tubo perianthii exsertus trilobatus.

Distribution.—Transvaal; Barberton district, grassy Mtn. sides, Aug.-Sept.; Galpin 477, in Nat. Herb. Pretoria (type); Nelsberg, Tafelkop, March, van der Merwe 1675; near Barberton, July, Hean in Nat. Herb. 24860; Lydenburg district, Sabie Valley, Oct., Gray in Nat. Herb. 4107; Carolina district, near Breyten, Sept., Dieperink 24.

In Fl. Pl. S. Afr. t. 211 (1926), a plant is figured under the name *C. collinus* Gawl., but it does not agree with the original description of this species. Judging by the specimen from which plate 211 was prepared, it seems probable that it represents a form of *C. bicolor*; the flowers in the plate have evidently been somewhat enlarged.

19. *C. BRACHYSCYPHUS* Baker in Handb. Amaryllid. 55. (1888).

Description.—*Bulb* ovoid. *Leaves* about 3, contemporary with the flowers, linear, 20-30 cm. long, 5-7 mm. broad. *Peduncle* about as long as the leaves, terete, glaucous. *Spathe-valves* 2, lanceolate 2.5 cm. long. *Pedicels* up to 2 cm. long. *Flowers* 6-8 in an umbel; *perianth* up to about 2.5 cm. long, pale red; *tube* funnel-shaped, dilated to a throat nearly 5 mm. wide; *lobes* oblong-lanceolate nearly as long as the tube. *Stamens* inserted near the throat of the tube; filaments nearly 5 mm. long.

Distribution.—Cape Province; Pondoland and possibly extending into the Transvaal.

Notes.—This is one of the smallest red-flowered species in the genus. It was introduced into cultivation from Pondoland in 1886, but I have seen no authentically named specimens. So far it has not been figured in any publication.

20. *C. RECTIFLORUS* Baker in Fl. Cap. 6, 222 (1896).

Description.—*Bulb* ovoid 3.75 cm. in diam. *Leaves* 2, contemporary with the flowers, linear, 6-9 mm. broad. *Peduncles* slender, 30-45 cm. long. *Spathe-valves* 2, lanceolate, not exceeding the pedicels. *Pedicels* ascending, 1.5-3 cm. long. *Flowers* 8-10 in an umbel, suberect; *perianth* 2.5-3 cm. long, red; *tube* dilated gradually from the base to a throat 4-5 mm. wide; *lobes* oblong, half as long as the tube. *Stamens* distinctly biseriate; filaments very short. *Style* as long as the perianth; stigma trifid.

Distribution.—Cape Province; King Williams Town district near the Perie forest.

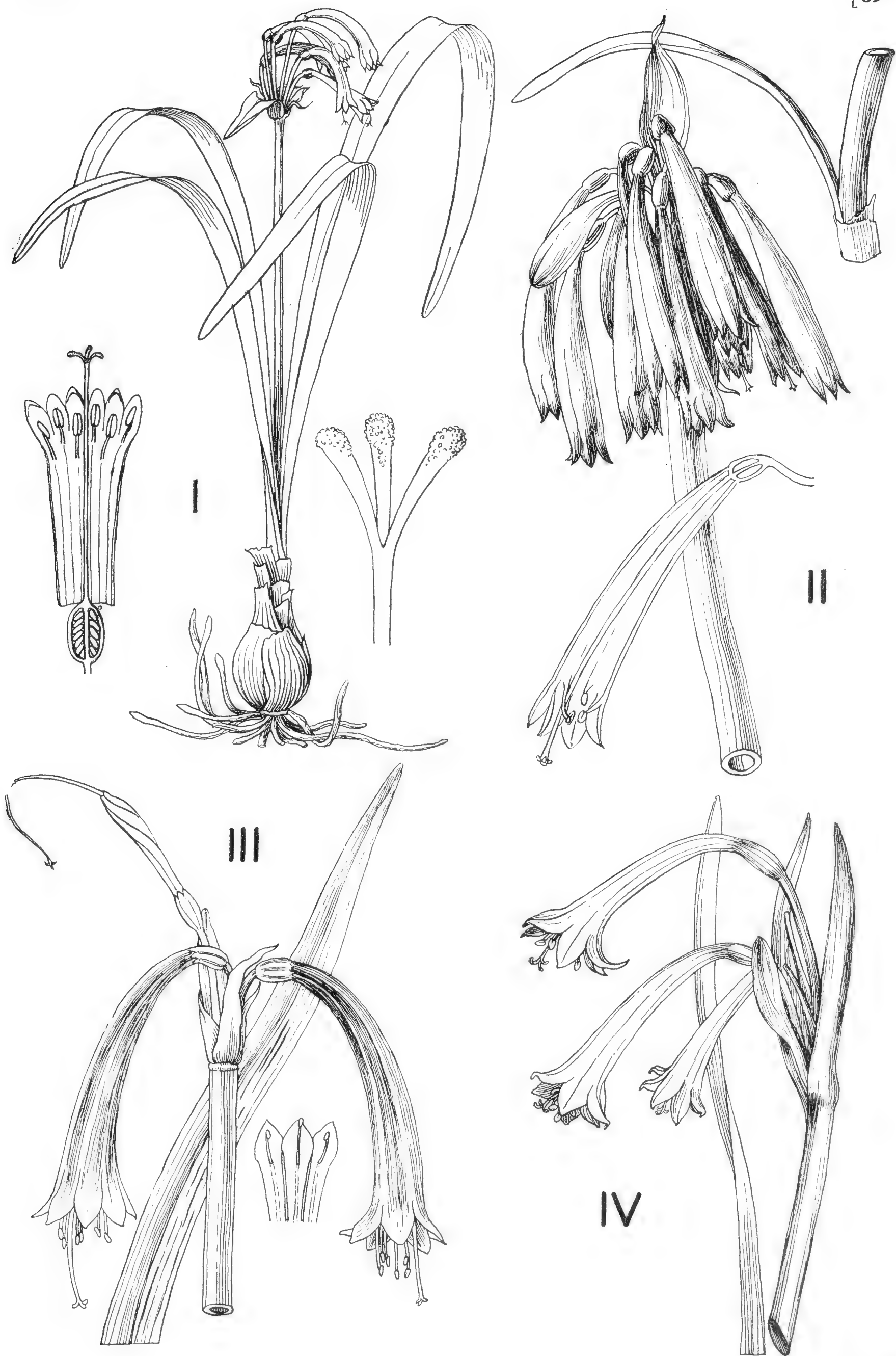
Notes.—I have seen no authentically named specimen of this species.

21. *C. JUNODII* Beauverd in Bull. Herb. Boiss. Ser. 2, 7, 437 (1907).

Description.—*Bulb* oval, 4 cm. in diam., produced into a short neck. *Leaves* 4-5, contemporary with or, in certain circumstances, absent at the time of flowering, lorate-lanceolate, obtuse, 30-50 cm. long, 1.5-2 cm. broad. *Peduncle* 25-50 cm. tall. *Spathe-valves* 2, ovate-lanceolate, 2-3 cm. long. *Pedicels* approximately equal to the spathe-valves. *Flowers* 6-9 in an umbel, nodding or sub-pendulous; *perianth* 3.5-4 cm. long, the tube red, the lobes yellow; *tube* curved, gradually dilated to the throat; *lobes* oblong, "4-5 times shorter than the tube" that is about 8-9 mm. *Stamens* biseriate, inserted in the throat of the tube, not exceeding the lobes. *Style* exserted, stigma trifid, apex papillose. (Pl. 141, I.)

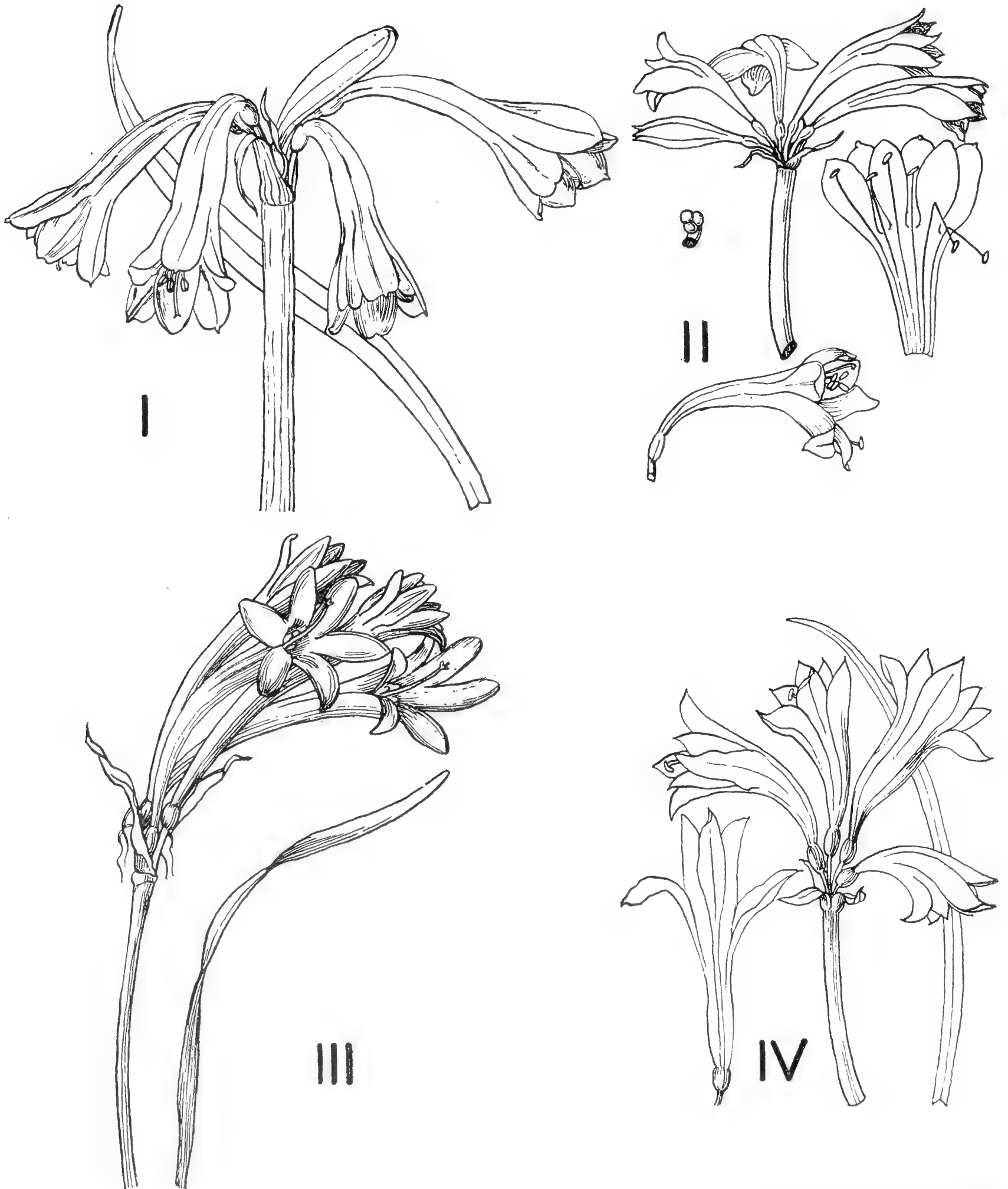
Distribution.—Transvaal ?; no definite locality.

Notes.—The Swiss Missionary, Henry Junod, forwarded the type plants from the Transvaal to Geneva, where they flowered in 1906. It is presumed that the specimens also originated in the Transvaal, although there is no actual proof of this. A plant collected at Baviaans Poort near Pretoria, appears to agree sufficiently well with the figure of the type to identify it as this species. Beauverd, when describing the species, stated that flowers were produced in September at the same time as the leaves, but other flowers were produced in February without leaves. The leaves grew in March and reached maturity in April. This effect was produced under greenhouse conditions and it is possible that this sequence would not be followed in nature.



I, *Cyrtanthus Junodii* Beauv. (After Bul. de L'Herb. Boiss. p. 438); II, *C. Tuckii* var. *transvaalensis* Verdoorn (After Fl. Pl. S. Afr. t. 680); III, *C. striatus* Herb. (After Bot. Mag. t. 2534); IV, *C. angustifolius* Ait. (After Bot. Mag. t. 271).
Plate 141

See pages 88, 91 and 92



See pages 93 and 94

I, *Cyrtanthus pallidus* Sims (After Bot. Mag. t. 2471); II, *C. Fergusoniae* L. Bolus (After S. Afr. Gard. & C. Life, 1931); III, *C. odoratus* Gawl. (After Bot. Reg. t. 503); IV, *C. inaequalis* O'Brien (After Gard. Chron. 1905, p. 261).

22. *C. RHODESIANUS* Rendle in Journ. Linn. Soc. Bot. 40, 211 (1911).

Description.—*Bulb* 1.5-2 cm. diam. extended into a neck, flowering before the leaves appear. *Leaves* undescribed. *Peduncle* 10 cm. long. *Spathe-valves* 2, lanceolate, nearly 3 cm. long, red. *Pedicels* slender, up to 1.5 cm. long. *Flowers* 2-3 or perhaps more in an umbel, bright red; *perianth* 3.5-4.5 cm. long; *tube* slender, gradually dilated to a throat 4 mm. wide; *lobes* narrowly oval, about 1 cm. long or longer, roughly $\frac{1}{4}$ the length of the tube. *Stamens* biseriate, filaments short, somewhat exserted from the perianth tube. *Style* about equal to the perianth in length, trifold.

Distribution.—Rhodesia; Chimanimani Mts. common amongst short grass at an altitude of about 7000 ft., flowering in September and October.

Notes.—Rendle states.—“Near *C. Welwitschii*. Hiern., but a much smaller plant with no leaves in the flowering stage. The flowers are relatively larger, with shorter pedicels and a narrower tube.”

F. Eyles collected specimens, No. 416, in Mazoe district, Rhodesia, which may be this species. He records the following notes; “In marsh, soil black humus. Bulb white with fleshy roots. Single leaf longer than the scape, with double ridge in centre of back. Scape 6-12 inches above ground, green, *solid*, terete. Perianth crimson outside, slightly paler within.” A duplicate of No. 416 in the Bolus Herb. has two leaves present which indicates *C. Welwitschii*, but the description of the perianth agrees better with that given for *C. rhodesianus*. Rendle. It may possibly represent an undescribed species.

23. *C. WELWITSCHII* Hiern ex Baker in Journ. Bot. 1878, 197.

Description.—*Bulb* ovoid, 2-3 cm. diam. *Leaves* about 4, contemporary with the flowers, linear, 30-45 cm. long, 6-9 mm. wide. *Peduncles* approximately as long as the leaves. *Spathe-valves* 2, lanceolate. *Pedicels* 2.5-3.75 cm. long. *Flowers* 3-8 in an umbel, erect. *Perianth* 3-3.75 cm. long, red; *tube* narrowly funnel-shaped; *lobes* oblong-lanceolate, rather shorter than the tube. *Stamens* biseriate, exserted from the perianth-tube. *Style* exserted from the perianth-tube, trilobed.

Distribution.—Angola; Nyasaland; on mountain ranges in moist places.

Notes.—I have not seen an authentically named specimen of this species. (See note under *C. rhodesianus*.) It would no doubt be of equal merit in horticulture as many of the allied species in South Africa.

24. *C. TUCKII* Baker in Journ. Bot. 1876, 183.

Description.—*Bulb* ovoid, up to 3.75 cm. diam. *Leaves* 2, contemporary with the flowers, linear, 30-45 cm. long, 6-9 mm. broad, green. *Peduncle* about equal in length to the leaves, 6-9 cm. in diam. *Spathe-valves* 2, lanceolate, 7.5-9 cm. long, green. *Pedicels* shorter than the spathe-valves. *Flowers* 10-15 in an umbel, occasionally less, nodding; *perianth* 3.75-5 cm. long, yellowish at the base, passing gradually upwards into deep blood-red; *tube* curved, dilated gradually from the base to a throat 8-9 mm. in diam.; *lobes* oblong, 6-9 mm. long, connivent. *Stamens* biseriate; filaments short, not exserted. *Style* exserted; stigma tricuspidate.

Var. a. *TRANSVAALENSIS* I. C. VERDOORN in Fl. Pl. S. Afr. t. 680 (1937); perianth red throughout. (Pl. 141, II.)

Var. b. *VIRIDILOBUS* I. C. VERDOORN, l. c. sub t. 680; perianth-lobes green, tube red.

Distribution.—Cape Province; Somerset East district, on the Boschberg at 4500 ft.; var. a. Transvaal high-veld; var. b. Natal, grassveld extending to eastern Cape.

Notes.—The figure of this species in “*The Gardeners Chronicle*” 1892, is certainly not life-like and must be considered as a diagrammatic representation.

Var. TRANSVAALENSIS I. C. VERDOORN in Fl. Pl. S. Afr. t. 680 (1937).

Miss I. C. Verdoorn states that this varietal form differs from the type in the perianth being red throughout, whereas the type is described by Baker as being "yellow at the base passing gradually upwards into deep blood-red." Further, the leaves of the type were present at the time of flowering whereas those of the variety appeared after the flowers. I do not think too much importance should be attached to the latter difference as Baker described from cultivated plants which might well account for the early leaf development. The bulb of the variety is relatively narrower and evidently has a longer neck than the typical form.

The variety *transvaalensis* occurs abundantly on the high grassveld of the Transvaal and has in the past been confused with *C. angustifolius* var. *grandiflorus* Baker. From this it differs in the connivent perianth-lobes and in this respect also, it differs from *C. contractus*, another Transvaal species. A further distinguishing feature from *C. contractus* is the latter's contracted perianth throat which does not occur in *C. Tuckii*.

Var. VIRIDILOBUS I. C. VERDOORN l. c. sub. t. 680.

This variety is distinguished by the green perianth-lobes and red tube. It is frequent in Natal and extends into the eastern Cape Province towards the locality of the typical form.

25. *C. ANGUSTIFOLIUS* (L. f.) Ait. Hort. Kew 414 (1789).

Description.—*Bulb* ovoid, about 4.5 cm. diam. contracted into a short neck. *Leaves* 2-3, contemporary with the flowers, about 45 cm. long when mature, rarely much longer, 0.7-2 cm. broad. *Peduncle* about equal to the leaves in height fairly stout. *Spathe-valves* 2, lanceolate, acute, 4-5 cm. long. *Pedicels* up to about the length of the spathe-valves. *Flowers* nodding or pendulous, 4-10 in an umbel; *perianth* cylindrical, curved, 4-5 cm. long, red; *tube* dilated gradually to a throat 0.8-1 cm. wide; *lobes* ovate-obtuse, spreading. *Stamens* biseriate, inserted towards the throat of the perianth-tube. *Style* exserted, trilobed. (Pl. 141, IV.)

Distribution.—Cape Province; western districts with headquarters on the mountains near Tulbagh.

Notes.—As mentioned in the introduction, I have not had the advantage of studying the material at Kew, which formed the basis of Baker's work in "*Flora Capensis*." In the case of *C. angustifolius* and Baker's two varieties *ventricosus* and *grandiflorus*, it is evident that at least 3 distinct species are concerned, namely, *C. angustifolius* ait. *C. ventricosus* willd. and *C. contractus* N. E. Br. The distribution records given by Baker for his varieties *ventricosus* and *grandiflorus* do not correspond entirely, however, with the distribution of the two species *C. ventricosus* and *C. contractus* (part of Baker's var. *grandiflorus*) as understood here, which suggests that further research in this group is desirable.

26. *C. STRIATUS* Herb. in Bot. Mag. t. 2534. (1825).

Description.—*Bulb* ovoid, 2.5-3 cm. in diam., contracted into a short neck. *Leaves* 2, contemporary with the flowers, about 30 cm. long and 1 cm. broad, narrowed to both ends, keeled below. *Peduncle* less than the leaves in height, hollow, reddish. *Spathe-valves* lanceolate, up to 3.5 cm. long, reddish below to greenish towards the tips. *Pedicels* shorter than the spathe-valves. *Flowers* 3 or probably more in an umbel, nodding or pendulous; *perianth* 6 cm. long; *tube* curved, gradually expanded from the base to a throat 1 cm. or more in diam., 5 cm. long, red with yellow stripes extending from the sinuses of the lobes; *lobes* ovate, about 1 cm. long, spreading, yellow. *Stamens* biseriate, equal to or exserted beyond the perianth lobes. *Style* longer than the perianth, trifid. (Pl. 141, III.)

Distribution.—Cape Province, without definite locality.

Notes.—It is stated in the text under the plate cited above that *C. striatus* was imported by Mr. Lee and sold by him to many persons, labelled *Amaryllis falcata* by the error of the collector. Baker l. c., while maintaining it as a distinct species, suggests that it may be a variety of *C. angustifolius* Ait. If only for its distinctive colouration, it seems advisable to maintain its specific identity in the hope that this will facilitate its rediscovery in the wild state.

27. *C. PALLIDUS* Sims in Bot. Mag. t. 2471 (1824).

Description.—*Bulb* ovoid, 3-3.5 cm. in diam., contracted into a short neck. *Leaves* up to 5, produced after the flowers, linear, about 15 cm. long, 6-7.5 mm. broad, narrowed to the base and apex, keeled on the lower surface. *Peduncle* much the same length as the leaves, purplish. *Spathe-valves* 2, lanceolate, 2-2.5 cm. long. *Pedicels* as long or shorter than the spathe-valves. *Flowers* about 5 in an umbel, spreading or pendulous; *perianth* up to 4.5 cm. long, pale red; *tube* dilated gradually to a throat 6-7 mm. in diam.; *lobes* oblong, 1.75 cm. long, 6-7 mm. broad. *Stamens* exserted from the perianth tube. *Style* as long as the perianth, trifid. (Pl. 142, I.)

Distribution.—Cape Province without definite locality.

Notes.—This plant was introduced into cultivation in 1822 by Villette. In the original account, which, with the figure, is all we know of the species, special mention is made of the "regular dimension of size of the corolla from the limb to the base, without any sensible inflation of the middle of the tube, and the nearly equal proportion of the limb to the tube." The latter remark is the more important, though the figure does not illustrate it quite as clearly as one is led to expect.

28. *C. ODORUS* Gawl. in Bot. Reg. t. 503 (1820).

Description.—*Bulb* ovoid, 2-2.5 cm. in diam., with a short neck. *Leaves* 2-3, contemporary with the flowers, linear, 12-15 cm. long, 2.5-3 mm. broad, slightly and gradually contracted to the apex and base. *Peduncle* approximately equal in length to the leaves, slender. *Spathe-valves* 2, lanceolate, 2.5-3 cm. long. *Pedicels* less than half the length of the spathe-valves, or subobsolete. *Flowers* about 4 in an umbel, nodding; *perianth* 5-6 cm. long, bright red; *Tube* about 4 cm. long, curved, narrowly trumpet-shaped, dilated gradually from a very slender base to a throat 6-7 mm. wide; *lobes* narrowly oblong, 1.5 cm. long, 5 mm. broad, somewhat spreading. *Stamens* markedly biseriate, included; filaments short. *Style* exserted, trifid. (Pl. 142, III.)

Distribution.—Cape Province, from whence it was introduced into England about 1818 without definite locality.

Notes.—This is another case in which our information is restricted to the type figure and description. Baker, l. c. cites only two specimens, both from Natal, under this name. To me, it seems most unlikely that he should be correct, since at the time of discovery botanists had not penetrated within 300 miles of Natal. One would expect records from the Cape and intervening country. The exceptionally short pedicels, narrowly oblong perianth lobes and fragrant flowers are the most noteworthy characters of this species. It shows some affinity to *C. ochroleucus* Burch and *C. Mackenii* Hook. f. in habit.

29. *C. INAEQUALIS* O'Brien in Gard. Chron. 1905, p. 261.

Description.—*Bulb* globose, about 3.75 cm. in diam. prolonged into a neck 2.5 cm. long. *Leaves* 2-3, contemporary with the flowers, 30 cm. or more long, linear, narrowing to the base, green, tinged with purple at the base. *Peduncle* erect, 30 cm. tall. *Spathe-valves* 4, two large and two small, lanceolate. *Pedicels* 0.5-1.2 cm. long. *Flowers* 4 in an umbel (in type specimen), more or less erect; *perianth* 6.25-7.5 cm. long bright red; *tube* trumpet-shaped in the lower half; *lobes* nearly as long as the tube, the bottom lobe decurved, the lateral two spreading, the upper three *inclined forward over the style*. *Stamens* biseriate, 3 nearly extending to the tips of the segments. *Style* not protruding, tricuspidate. (Pl. 142, IV.)

Distribution.—Cape Providence; George district in the neighborhood of George.

Notes.—When the type specimen flowered in England in 1904, it was considered by some authorities to be *C. angustifolius*, var. *grandiflorus*. The author of the species, however, points out that it differs from this by the more or less erect habit of the flowers, the larger perianth-segments and especially in the manner in which the upper segments form a "pent-house" over the stigma and anthers. There is a striking resemblance to this in *C. Fergusoniae* L. Bolus.

30. *C. FERGUSONIAE* L. Bolus in S. Afr. Gard. and Country Life 1931, 21, 77.

Description.—*Bulb* ovoid, up to 4.5x3.5 cm., flowering in the absence of leaves. *Leaves* 1(?) from each bulb, linear, glabrous, 35 cm. or more long and about 5 mm. broad. *Peduncle* hollow throughout its length, 20-45 cm. long, 0.7-1.1 cm. diam. *Spathe-valves* up to 8 cm. long and 2 cm. broad. *Pedicels* 1-2 cm. long. *Flowers* 4-8 in an umbel, spreading or somewhat pendulous; *perianth* 6-8 cm. long, brilliant red; *tube* 4-5 cm. long, curved, gradually dilated to a throat 7-9 mm. wide; *lobes* obtuse, 2-3 cm. long, 0.9-1.3 cm. broad. *Stamens* biseriate; filaments 1.2-1.8 cm. long, the outer three attached to the base and the three inner ones well above the base of the perianth-lobes. *Style* about as long as the stamens; stigmas very short and rounded. *Capsule* sub-clavate-cylindrical, up to 3 cm. long, the seeds 8 mm. broad. (Pl. 142, II.)

Distribution.—Cape Province; Riversdale district, common on the sandy hills near Still Bay.

Notes.—Of this species Dr. L. Bolus writes in "South African Gardening & Country Life" 1931, that it is most nearly related to *C. ventricosus* Willd. (a species included in *C. angustifolius* by some authors) but that it is distinguished from this by the longer perianth lobes, sometimes nearly as long as the tube and the set is different. When first open the perianth lobes have a somewhat asymmetrical appearance unusual in the genus. The species is common on the sandy hills near Still Bay from which area the type material was collected by Mrs. E. Ferguson in January, 1931. It was collected in that area by Dr. John Muir in 1914 but his specimens have remained specifically unidentified until now. I have examined no authentically named specimen of *C. inaequalis* O'Brien, but judging by the description and figures given by the two respective authors, there can be little doubt that the two plants are very closely related. I have refrained from uniting the two forms under the one name owing to the difference in leaf production and other small differences in the descriptions. Field observations might well lead to the conclusion that only one species is concerned and in this case the name *C. inaequalis* would have priority.

31. *C. CONTRACTUS* N. E. Br. in Fl. Pl. S. Afr. 1, t. 4 (1921).

Description.—*Bulb* 4-6 cm. in diameter, ovoid, produced into a neck about 3 cm. long. *Leaves* 2-3, contemporary with or developed after the flowers, 30-50 cm. long, 0.8-1.2 cm. broad, linear, acuminate, narrowed to the base. *Peduncles* about 20 cm. long, 10 mm. in diameter, hollow, red. *Spathe-valves* linear, acute, 4.5-5 cm. long. *Pedicels* 2-4 cm. long. *Flowers* 4-10 in an umbel, pendulous; *Perianth* 6.5-7.5 cm. long scarlet red to carmine; *tube* 5-6 cm. long, somewhat inflated and widest about the middle, contracted towards the throat; *lobes* ovate-ellipsoid, 1.3-1.5 cm. long, about 7 mm. broad. *Stamens* inserted shortly within the throat of the perianth, slightly exserted. *Style* about the length of the perianth tube, trifold. (Pl. 143, I.)

Distribution.—Transvaal; Pretoria district in grassveld and in districts of the eastern Transvaal extending through Natal to the eastern Cape Province.

Notes.—In Flora Capensis this species was confused with *C. angustifolius* Ait., being considered by Baker as part of his variety *grandiflorus*. It is distinguished by the perianth tube being inflated in the middle and contracted towards the throat. Although it is usual for the flowers to appear before the leaves this is not invariably so, depending on the habitat conditions. Not all bulbs flower every year and those

not flowering may produce leaves when their neighbours are producing the first signs of a peduncle. According to my present conception, this is the commonest of the so called "fire-lilies" which are characteristic of grassveld burnt in the winter or early spring.

32. *C. COLLINUS* *Gawl.* in *Bot. Reg.* t. 162 (1816).

Description.—*Bulb* ovate, up to 4 cm. in diam. Leaves 3, contemporary with the flowers, linear, 15-25 cm. long, 5-8 mm. broad, glaucous, flattish towards the apex, channelled below. *Peduncle* hardly as long as the leaves, slender, glaucous. *Spathe-valves* 2, lanceolate, about 2.5 cm. long. *Pedicels* up to 2.5 cm. long. *Flowers* up to about 10 in an umbel; *perianth* more or less 5 cm. long, bright red with whitish lines extending along the perianth from the ovary; *tube* curved at the base, slender in the lower half, dilated above to a throat nearly 1 cm. wide; *lobes* oblong-obtuse, approximately 1.25 cm. long. *Stamens* indistinctly biseriate, filaments short. *Styles* shortly trifid. (Pl. 143, IV.)

Distribution.—Cape Province; Caledon district, near Genadendal and possibly extending to the eastern Cape Province.

Notes.—In the notes following the original description the author compares this species with *C. angustifolius* Ait., from which it is said to differ in having glaucous leaves, whitish lines extending along the perianth from the ovary, lobes of perianth elliptic oblong, obtuse, not ovate acute, etc. To me, even more important is his statement in the description, that the perianth tube is slender in the lower half, and dilated in the upper half to the throat; *C. angustifolius* having the perianth tube evenly dilated from the base to the throat. The figure in Fl. Plt. S. Afr. t. 211 (1926) does not illustrate the species correctly and probably represents a cultivated form of *C. bicolor*.

33. *C. VENTRICOSUS* (*Jacq.*) *Willd.* *Sp. Pl.* 2.49 (1799).

Description.—*Bulb* ovate-globose with a short neck, totalling 5 cm. long. Leaves produced after the flowers, 2, rarely only one, linear-lanceolate, up to about 16 cm. long and 4 mm. broad, more or less obtuse, somewhat canaliculate. *Peduncle* slightly compressed, dark red, glaucous, about 15 cm. tall, 6-7 mm. thick. *Spathe-valves* lanceolate, 4 cm. long, red. *Pedicels* shorter than the spathe-valves. *Flowers* 3-7 in an umbel, spreading or nodding; *perianth* 5-5.5 cm. long, red; *tube* curved narrowly cylindrical at the base, expanded above, and again contracted to a throat nearly 1 cm. wide, ribbed; *lobes* oval-oblong, 1.5-1.75 cm. long, about 0.75 cm. broad, spreading, three outer ones glandular within the apex. *Stamens* excluded, ascending and curved downwards towards the anthers. *Style* exserted, subtrifid, slightly longer than the stamens. (Pl. 145, I.)

Distribution.—Cape Province, on open hillsides from the Cape Peninsula eastwards to about Mossel Bay district.

Notes.—Baker included this species as a variety under *C. angustifolius* Ait. but I do not consider he was justified in doing so, especially as Willdenow gave good reasons for establishing his species. The ribbed, ventricose or inflated perianth-tube and comparatively large perianth-lobes, readily distinguishes it from *C. angustifolius*. It is evidently one of the more attractive of the south-western Cape species, although not large.

34. *C. STAADENSIS* *Schonl.* in *Rec. Alb. Mus.* 3, 61 (1914).

Description.—*Bulb* subglobose or oblong, 2-3 cm. in diameter. Leaves 2-3, contemporary with the flowers, narrowly linear, almost setaceous, 25-28 cm. long, 2 mm. wide, canaliculate above tapering to the base. *Peduncle* about 40 cm. tall. *Spathe-valves* broadly lanceolate, 2-5 cm. long. *Pedicels* 1.2-1.7 cm. long. *Flowers* usually 3 (rarely 4-6) in an umbel; *perianth* 4.5-5 cm. long; *tube*, lower portion narrow, curved and 6 mm. long, dilated above, somewhat hexagonal and inflated,

1 cm. broad in the broadest portion; *lobes* spreading, ovate-lanceolate, 1 cm. long. *Stamens* slightly biseriate, inserted near the mouth of the perianth-tube. *Style* nearly the length of the perianth, shortly trifid.

Distribution.—Cape Province; Uitenhage district, near Van Staadens.

Notes.—Although the author of the species did not mention the hexagonal or somewhat fluted nature of the perianth-tube in the description of the type, he recorded the fact in his MSS. notes. This character is most unusual in the genus. Like a number of other species the distribution records are meagre. The typical form has not been recorded outside the Uitenhage and Port Elizabeth districts. A plant with a very similar shaped corolla tube, except for the marked hexagonal fluting occurs near Grahamstown in the Albany district adjacent to Uitenhage, and it may represent a variety of *C. staadensis*, but data are insufficient as yet on which to arrive at a conclusion on this point.

35. *C. SPIRALIS* Burch. ex Gawl. in Bot. Reg. t. 167 (1816).

Description.—*Bulb* oblong, about 4 cm. in diam. *Leaves* 2-3, generally appearing after the inflorescence, linear, spirally twisted, 15-20 cm. long, about 1.25 cm. broad, glaucous green. *Peduncle* taller than the leaves, reddish, glaucous. *Spathe-valves* 2, lanceolate, 3 cm. long. *Pedicels* up to the length of the spathe-valves. *Flowers* 4-7 in an umbel; *perianth* about 4-7 cm. long, vermilion; *tube* slender at the base, curved, expanding above to a throat about 1 cm. diam.; *lobes* elliptic-oblong, about 1.25 cm. long, spreading. *Stamens* slightly exserted from the perianth tube. *Style* about equal to the stamens, trifid. (Pl. 143, III.)

Distribution.—Cape Province; Port Elizabeth, Uitenhage and Alexandria districts.

Notes.—The combination of narrow, spirally twisted leaves with curved trumpet-shaped red flowers, readily distinguishes this species from its near affinities. No other species with narrow trumpet-shaped flowers has spirally twisted leaves and the two which have twisted leaves, *C. helictus* and *C. Smithiae*, have somewhat bell-shaped pink flowers. The beautiful painting in the "*Botanical Register*" was made from plants collected by the famous naturalist, William Burchell, early in the 19th century, and cultivated at Fulham, England.

36. *C. LEUCANTHUS* Schltr. in Engl. Jahrb. 24. 454, (1898).

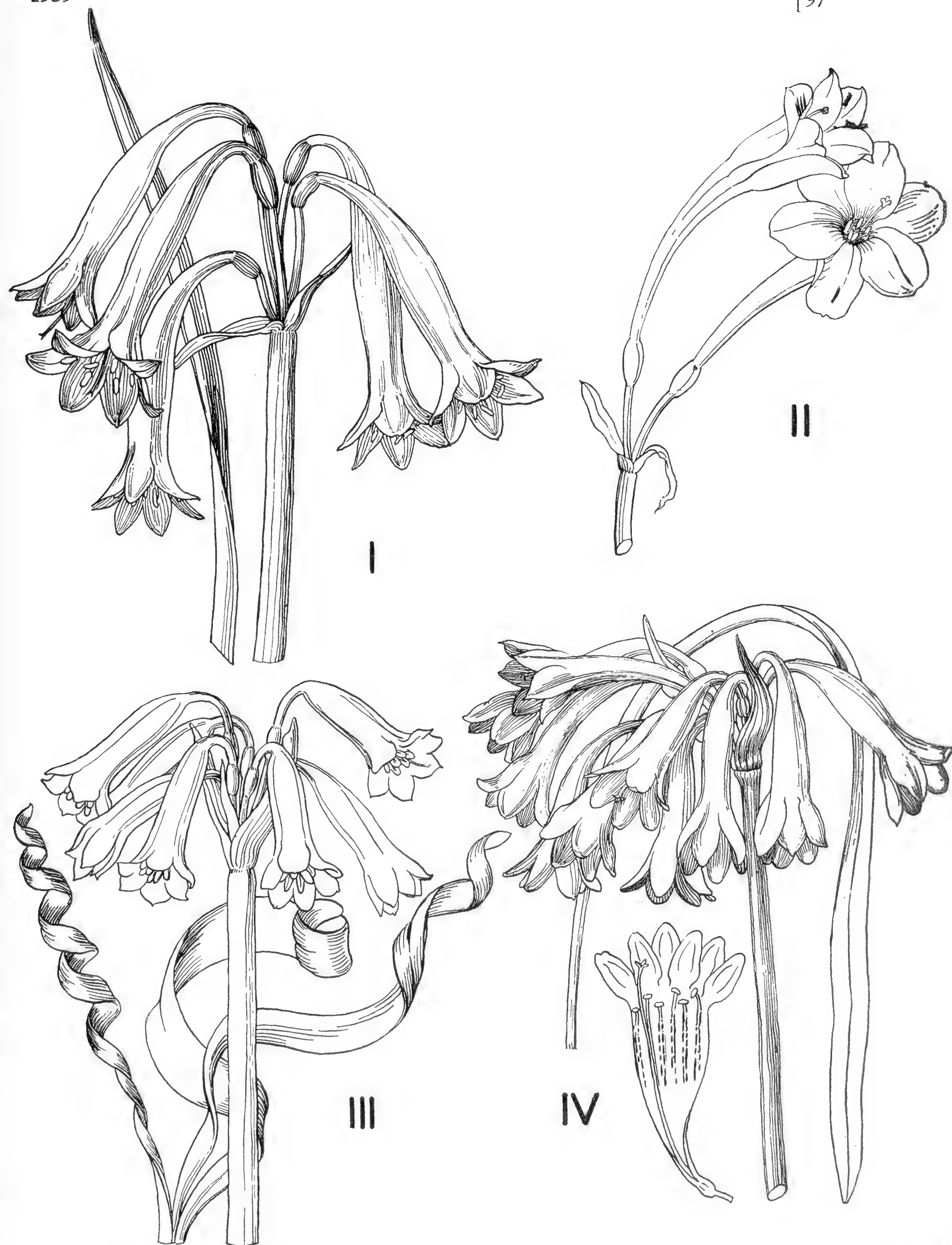
Description.—*Bulb* obovate, contracted into a neck. *Leaves* solitary, filiform, acute, shorter than the peduncle, 1 mm. broad. *Peduncle* "the thickness of a goose's quill," somewhat glaucous, 15-25 cm. tall. *Spathe-valves* longer than the pedicels. *Pedicels* erect, 1.3-1.5 cm. long, 1 mm. thick. *Flowers* 1-2 on a peduncle; *perianth* about 6 cm. long, white and "very beautiful;" *tube* cylindrical, 4 cm. long 3 mm. broad, curved, dilated from the base to a throat 6 mm. wide; outer lobes ovate-oblong, acuminate, 2 cm. long, 0.9-1.2 cm. broad, the inner ones obtuse and slightly shorter, *Stamens* biseriate, reaching the mouth of the perianth-tube. *Style* longer than the stamens, trifid. (Pl. 143, II.)

Distribution.—Cape Province; in stony places on Houwhoek Mt. at an alt. of 600m., flowering February.

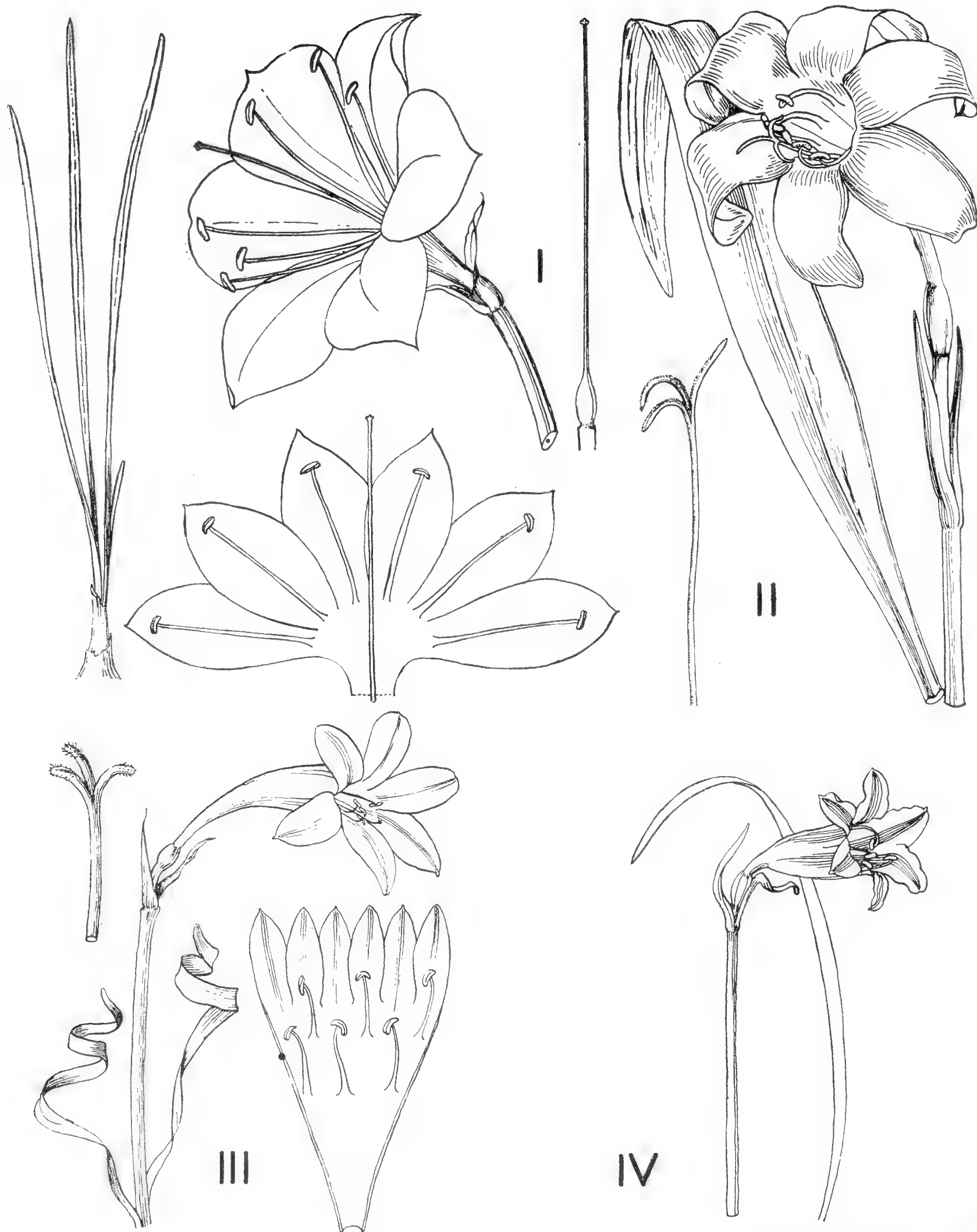
Notes.—Schlechter points out that (according to Baker's classification) this species has the habit of the species in the *Gastronema* group and the flower of the *Monella* group. It is one of the connecting links referred to in the introduction which induced me to dispense with subgeneric or group names.

37. *C. GUTHRIEAE* L. Bolus, in Ann. Bolus Herb. 3, 79 (1921).

Description.—*Bulb* globose-ovoid, 3 cm. long, 2.5 cm. diam. *Leaves* produced after the flowers, linear, up to about 15 cm. long, 2 mm. broad. *Peduncle* about 11



I, *Cyrtanthus contractus* N. E. Br. (After photo by H. King, 1936); II, *C. leucanthus* Schlecht. (After sketch in Bolus Herbarium); III, *C. spiralis* Burch. ex. Gawl. (After Bot. Reg. t. 167); IV, *C. collinus* Gawl. (After Bot. Reg. t. 162).
 See pages 94, 95 and 96
 Plate 143



See pages 99 and 102

I, *Cyrtanthus Guthrieae* L. Bolus (After drawing in Bolus Herbarium by Guthrie and Carter); II, *C. sanguineus* Lindl. (After Bot. Mag. t. 5218); III, *C. helictus* Lehm. (After Fl. Pl. S. Afr. t. 99); IV, *C. clavatus* R. A. Dyer (After Bot. Mag. t. 2291).

cm. long, curved. *Spathe-valves* 2, lanceolate, attenuate, 3.3 cm. long. *Flower* 1, rarely 2, sessile, bright red with a golden glitter; *perianth* about 8.5 cm. long; *tube* 4.3 cm. long, 4 mm. in diam. at the base, cylindric, gradually expanded above to 1.1 cm. diam. at the throat; *lobes* obovate-oblong, acute, 4.3 cm. long, 1.9 cm. broad. *Stamens* uniseriate; filaments 3-3.5 cm. long. *Capsule* (immature) cylindric, 1.5 cm. long, 0.7 cm. in diam.; the seeds dark brown, 7 mm. long. (Pl. 144,I.)

Distribution.—Cape Province, south-western Cape, Bredarsdorp.

Notes.—In this case I can do no better than quote the following notes which were published with the original description of the species. "A very distinct species, differing from all the rest in having sessile flowers, widely spreading perianth-segments which are as long as the tube, while the tube itself is proportionately much more slender. The spread of the perianth and the relatively long tube are more characteristic of *Vallota* than *Cyrtanthus*, but there is no doubt the two genera are very closely related, and *C. Guthrieae* may almost be considered a connecting link. In *Vallota* the filaments are often adnate to the perianth-segments."

It is evidently a very local species.

38. *C. CLAVATUS* (L'Herit.) comb. nov. *Amaryllis clavata* L'Herit. Sert. Angl. 11 (1788). *Cyrtanthus uniflorus* Gawl. in Bot. Reg. t. 168 (1816); Baker in Fl. Cap. 6, 226, (1896), et syn.

Description.—*Bulb* ovoid, 1.7-2.5 cm. in diam., produced into a short neck. *Leaves* 1-2, contemporary with the flowers, linear, about 1-3 mm. broad. *Peduncle* slender, 8-20 cm. long, hollow. *Spathe-valves* 2, linear-lanceolate to lanceolate, 2-4 cm. long. *Pedicels*, if flowers solitary, about half the length of the spathe-valves, if more than one flower, up to 3 cm. *Flowers* 1-3 on each peduncle; *perianth* 4-6 cm. long, more or less horizontally spreading, with 6 conspicuous red, reddish-brown or green stripes extending down the perianth-tube and along the lobes; *tube* 2.5-3.5 cm long with a short slender base from which it is dilated somewhat abruptly and thence gradually to the throat 1.5-2 cm. wide; *lobes* ovate-oblong, 1.5-2.5 cm. long. *Stamens* biseriate, somewhat exserted. *Style* exserted, trilobed. (Pl. 144,IV.)

Distribution.—Cape Province; eastern area, mainly in coastal grassveld.

Notes.—In this case we have the unfortunate necessity of a name change. The specific epithet *clavatus* was the earliest validly published and has priority under the International Rules of Nomenclature. Herbert noted the priority of L'Heritier's specific epithet *clavatus* in his "*Amaryllidaceae*" (1837), but there he transferred it from *Amaryllis* to a separate genus *Gastronema*.

C. clavatus occurs commonly in certain grassveld areas of the eastern Cape Province, but only under favourable climatic conditions is there a profusion of flowers. The normal flowering period is either December or January. It is another of the attractive species introduced to England by Masson, who made joint botanical expeditions at the Cape with Karl Peter Thunberg, a Swede, later termed the Father of South African Botany.

39. *C. HELICTUS* Lehm. Delect. Sem. Hort. Hamburg. (1839).

Description.—*Bulb* ovoid, 2-3.75 cm. in diam., contracted into a neck 1-3 cm. long, sometimes budding and growing in clumps. *Leaves* 2-4, contemporary with the flowers, linear, 8-14 cm. long, 3-5 mm. broad, spirally twisted. *Peduncle* arising at the side of the leaves and usually somewhat shorter than them, terete, hollow. *Spathe-valves* lanceolate, about 3 cm. or more long. *Pedicels* shorter than the spathe-valves. *Flowers* 1-3 on a peduncle; *perianth* 4.5-6.5 cm. long, white with brown or green stripes extending from the tube along the lobes; *tube* 2.5-4.5 cm. long, narrow and curved at the base, dilated gradually to a throat 1-1.3 cm. in diam.; *lobes* oblong, 1.5-2 cm. long. *Stamens* markedly biseriate, exserted. *Style* exserted further than the stamens, trilobed. (Pl. 144,III.)

Distribution.—Cape Province; south eastern districts of the Cape extending to Queenstown and Idutywa, usually under semiarid conditions.

Notes.—Except for the spirally twisted leaves *C. helictus* is very similar to *C. clavatus*. While both species occur in the same geographical regions, the former shows a preference for semiarid areas with a rainfall of less than 20 ins. per annum, whereas the latter is more restricted to grassveld areas with an annual rainfall of over 20 ins.

40. *C. SMITHIAE* Watt ex Harv. Gen. S. Afr. Pl. 338 (1838). *C. Smithianus* Herb. in Bot. Mag. sub. t. 3779 (1841); Baker in Fl. Cap. 6, 227. (1896).

Description.—*Bulb* ovoid 3.5-5 cm. in diam., with a short neck. *Leaves* 2-4, contemporary with the flowers, linear, 15-30 cm. long, 5-8 mm. broad, spirally twisted, somewhat glaucous. *Peduncle* about the same length as the mature leaves. *Spathe-valves* 2, lanceolate. *Flowers* 2-3 to a peduncle, more or less horizontally spreading; *perianth* 8-10 cm. long, white or pale pink with red or reddish-brown stripes extending along the lobes from the tube; *tube* slender at the base and slightly curved, broadened above to a throat about 2.5 cm. in diam.; *lobes* oblong, about 2.5 cm. long. *Stamens* biseriate. *Style* trilobed.

Distribution.—Cape Province; south-eastern districts in arid or semi-arid habitats.

Notes.—It will be noted that the name Smith has been Latinized in two different ways in naming this plant. The specimens on which the two names were founded had the same origin, but Herbert was evidently unaware of Harvey's specific publication. Harvey, writing of *Cyrtanthus* in his Genera, 1838, includes the statement: "There are several species, one of the most elegant of which, *C. Smithiae*, Watt M.S.S., was brought from Cafferland by Mrs. Col. Smith in 1836, and blossomed in Mr. Watt's garden at Rondebosch last year. It has large white flowers, each segment marked with a rose coloured band, and spiral, strap-shaped leaves" (Mrs. Col. Smith was Col. Sir Harry Smith's wife.)

C. Smithiae is similar to *C. helictus* Lehm. and has been confused with it in several collections, but is altogether more robust than it. The confusion is no doubt partly attributable to Baker who gives the distribution record in Flora Capensis as, "Lorenco Marques; Lombobo Mountains, Mrs. K. Saunders" without any mention of "Cafferland" (eastern Cape). The two localities are approximately 500 miles apart and I very much doubt whether Baker's identification of the Saunders specimen is correct. Several specimens agreeing with Harvey's concise description have been collected in the eastern Cape and I am personally able to support Harvey's statement, that it is one of the most elegant species in the genus. To see it in a setting of dusty karroid scrub in the Fish River Valley in the Albany district, is indeed a pleasant surprise.

41. *C. THORNCROFTII* C. H. Wright in Kew Bull. 1909. p. 421.

Description.—*Bulb* subglobose, 2 cm. diam. with a neck 3-5 cm. long and 7 mm. thick. *Leaves* 2, contemporary with the flowers, linear, acuminate and tapering to the base, 15-20 cm. long and 5 mm. broad. *Peduncle* slightly compressed, about 25 cm. tall, 3 mm. thick. *Spathe-valves* about 3.5 mm. long. *Pedicels* up to 2 cm. long. *Flowers* 1-2 uniformly pale salmon pink; *perianth* about 3 cm. long; *tube* 1.7-2 cm. long, narrow at the base for about 5 mm., curved, expanding sharply to the throat, funnel-shaped; *lobes* equal or slightly shorter than the tube, elliptic-oblong, acute. *Stamens* inserted in the throat of the perianth-tube, outer filaments 2 mm. long, the inner ones 4 mm. long. *Ovary* triangular. *Style* 3 cm. long with recurved branches 4 mm. long.

Distribution.—Transvaal, hills 3500 ft. alt., near Barberton.

Notes.—This species was described by Wright from a plant which flowered in Ireland in July 1908, evidently having been received there from Mr. George Thorncroft of Barberton, Transvaal. Mr. Thorncroft first collected plants in that area as early as 1890. Although *C. Thorncroftii* was first collected so many years ago, there are very few subsequent records.



See pages 95 and 103

I. *Cyrtanthus ventricosus* Willd. (After Jacq. Pl. Rar. t. 76); II, *C. vittatus* Desf. (After Redouté Lil. 1807).

Wright compared the species with *C. clavatus* (*C. uniflorus*) which he evidently considered its nearest affinity. It appears to be more closely related to *C. Galpini*, which occurs in the same district. It is, however, readily distinguished from this by the size and shape of the flowers.

42. *C. GALPINI* Baker in Kew Bull. 1892, p. 83. *C. Balenii* Phillips in Fl. PL. S. Afr. 1929, t. 343.

Description.—*Bulb* ovoid, 2-3 cm. in diam., contracted into a short neck. *Leaves* usually one from each bulb, usually produced somewhat later than the peduncles, linear, up to about 20 cm. long and 3 mm. broad, tapering to a filiform base. *Peduncle* up to 20 cm. long, 3-5 mm. diam., terete, hollow. *Spathe-valves* 2.5-4 cm. long, membranous. *Pedicels* shorter than the spathe-valves. *Flowers* solitary or occasionally 2 on a peduncle; *perianth* 5-8 cm. long, bright red to pink; *tube* narrow and curved in the basal portion which is 1.3-2 cm. long, abruptly dilated above to about 1.3 cm. wide at the throat; lobes ovate, about 2 cm. long. *Stamens* attached to the corolla-tube for varying distances, imperfectly biseriate. *Style* exerted further than the anthers, trifid.

Distribution.—Transvaal; Barberton district to northern Natal on the coast and inland, growing socially in grassveld and scattered in stony scrubveld.

Notes.—In "*Herbertia*" 3, 36 (1936) this plant appeared under the name *C. Balenii*. Since that time it has been possible to study further material, and it is now felt that the plants originally described as *C. Balenii* are not specifically distinct from *C. Galpini*. The height of the insertion of the filaments in the perianth-tube varies; the thickness of the peduncles is also a variable character and it was on these features that the two plants were at first thought to be distinguishable.

The typical form of *C. Galpini* collected in 1889 in the Barberton district by Dr. E. E. Galpin was recorded by him as being "scarlet in colour dusted with gold." The colour varies in different localities from crimson to pink, and it was the latter colour-form which was figured in Fl. Pl. S. Afr. t. 159 (1924).

43. *C. SANGUINEUS* (Lindl.) Hook. in Bot. Mag. t. 5218 (1860).

Description.—*Bulb* ovoid, comparatively large for the genus, up to 8 cm. in diam., contracted into a cylindrical neck up to 10 cm. long. *Leaves* 2-4, contemporary with the flowers, linear-lanceolate, up to 40 cm. long and 1-2 cm. broad, tapering gradually to both ends, channelled down the upper surface, keeled down the back. *Peduncle* up to 30 cm. tall, hollow. *Spathe-valves* usually 2, lanceolate, up to 8 cm. long. *Pedicels* from nearly obsolete to 3 cm. long, rarely up to 4 cm. long. *Flowers* 1-2, rarely 3 on a peduncle, suberect; *perianth* 7.5-10.5 cm. long, bright red; *tube* subcylindrical towards the base, straight or somewhat curved, dilated above to a throat 2.5-3 cm. wide; lobes oblong, 3-4 cm. long, 1.25-1.75 cm. broad, spreading or recurved. *Stamens* biseriate, reaching the throat of the perianth-tube. *Style* exerted, trilobed. (Pl. 144, II.)

Distribution.—Eastern coastal districts of the Cape Province, extending into Natal, usually found in or near scrub bush in river valleys; also recorded from British East Africa by Baker.

Notes.—It is among the most handsome members of the genus and from the time of its discovery has attracted attention in horticulture, with the result that it has been figured in several important works. Lindley describes, and his accompanying figure depicts, a single sessile flower on a peduncle. All the specimens examined by me in South African herbaria show pedicellate flowers. The pedicel is, however, occasionally very short. Mr. D. G. Collett made the same observation after an examination of the material at Kew. Whether Lindley's flower was sessile or subsessile does not appear of great consequence since the eastern Cape specimens agree with the description and figure otherwise of his plant from "Caffraria."

C. sanguineus has on more than one occasion given rise to an intergeneric hybrid with *Vallota speciosa* Dur. & Sch. (*V. purpurea*).

44. *C. VITTATUS* Desf. ex Red. Lil. t. 182 (1807).

Description.—*Bulb* globose, up to 4 cm. in diam. *Leaves* 5-6, contemporary with the flowers, linear. *Peduncle* terete, 15-25 cm. long. *Spathe-valves* 2, lanceolate, 3-4 cm. long, greenish. *Pedicels* very short. *Flowers* 5-6 in an umbel; *perianth* about 7.5 cm. long, white striped with red-brown; *tube* slender in the lower half, dilated gradually to a throat about 1.25 cm. in diam.; *lobes* oblong, 1.25 cm. long. *Stamens* exserted from the throat of the perianth-tube. *Style* exserted beyond the stamens. (Pl. 145, II.)

Distribution.—Unknown.

Notes.—The type figure, an adaptation of which is reproduced here, does not convey to me the impression of a species of *Cyrtanthus*, and it differs from all others in the very long and slender basal portion of the tube, which is abruptly dilated in the uppermost third. The stigma also appears distinctive. In recording my doubt as to whether it is a plant native to South Africa, a free translation is given here of the original French account for the information of those interested.

"The plate which we present here is copied from a drawing made by Mlle. Basseporte, and preserved among the records of the Natural History Museum. We have never seen the plant in question, but according to the drawing which we have on hand, one sees plainly that this plant belongs to the genus *Cyrtanthus*; and from the first glance, it is distinguished from the known species by the longitudinal bands which decorate the limb of the flower.

Its country is unknown; the analogy (i.e. identification as *Cyrtanthus*) might permit one to think that it is indigenous to the Cape of Good Hope."

Is the artist or the botanist at fault?

INDEX TO SPECIES IN ENUMERATION

angustifolius	25.	Macowani	14.
var <i>grandiflorus</i>	31.	obliquus	1.
var <i>ventricosus</i>	33.	O'Brieni	13.
attenuatus	7.	ochroleucus	5.
<i>Balenii</i>	45.	odorus	28.
bicolor	18.	pallidus	27.
brachyscyphus	19.	parviflorus	10.
carneus	2.	rectiflorus	20.
clavatus	38.	rhododactylus	16.
collinus	32.	rhodesianus	22.
contractus	31.	rotundilobus	12.
<i>Elliotii</i>	17.	sanguineus	43.
epiphyticus	15.	Smithiae	40.
falcatus	3.	<i>Smithianus</i>	40.
Fergusoniae	30.	spiralis	35.
Flanagani	8.	staadensis	34.
flavus	4.	stenanthus	9.
Galpini	42.	var <i>major</i>	9.
Guthrieae	37.	<i>Stayneri</i>	11.
helictus	38.	striatus	26.
Huttoni	17.	suaveolens	11.
inaequalis	29.	Thorncroftii	41.
Junodii	21.	Tuckii	24.
leucanthus	36.	var <i>transvaalensis</i>	24.
<i>lutescens</i>	5.	var <i>viridilobus</i>	24.
<i>lutescens</i>		<i>uniflorus</i>	38.
var <i>Cooperi</i> in part	6.	ventricosus	33.
var <i>Cooperi</i> in part	9.	vittatus	44.
Mackenii	6.	Welwitschii	23.
var <i>Cooperi</i>	6.		



Nat'l Bot. Gardens, Kirstenbosch

See page 105

Agapanthus orientalis in the National Botanic Gardens, Kirstenbosch; Frances M. Leighton appears on right.

A BRIEF REVIEW OF THE GENUS AGAPANTHUS

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Our conception of the Agapantheae as a tribe of the Amaryllidaceae dates only from the publication of Dr. J. Hutchinson's classification of the Monocotyledons in 1934. The group Agapantheae comprises the genera *Agapanthus* and *Tulbaghia* which show greater morphological affinity with the Amaryllidaceous Genus *Clivia* than with any members of the Liliaceae.

The history of *Agapanthus* as a garden plant is a fascinating study. It appears to have been one of the earliest of the Cape flowers to be introduced into European gardens. This is not surprising since *Agapanthus africanus* (L.) Hoffmegg grows plentifully on the slopes of Table Mountain and the vivid violet-blue colour of its flowers would immediately have attracted the attention of the sailors who first landed on these shores.

As far as I know the first reference in literature to *Agapanthus* is to be found in Jakob Breynius' *Prodromus Fasciculi Plantarum Rariorum* (1679). He calls it the blue African Hyacinth and says that it flowered in the previous year in the garden of the most illustrious and excellent Master Hieronymus a Beverningk. In 1739 his son, Johannes Phillip, republished the *Prodromus* with further illustrations of some of the plants mentioned by his father and amongst these is *Agapanthus africanus*. The species is referred to in Hermann's *Catalogue of the Leyden Botanic Garden* published in 1687. In Plunkenets *Almagestum* 1696 there is a figure of *Agapanthus africanus* and under it the statement that this species was in cultivation in Hampton Court Gardens in 1692. In all these works and also in those of Seba and Van Royen it appears under the name of *Hyacinthus*. In 1653 Linnaeus in his *Species Plantarum* published a description of the plant as *Crinum africanum*. L'Heritier in his *Sertum Anglicum* established the genus *Agapanthus* and overlooking Linnaeus' specific name of *africanus* bestowed the epithet *umbellatus* on the species. *Agapanthus umbellatus* was the name accepted for the species until quite recently, although, L'Heritier's error had been rectified by Hoffmansegg in 1824.

In the meantime a second species of *Agapanthus* had been introduced into European gardens and this was also included under the name *A. umbellatus*. This is the species which has recently been described as *A. orientalis* (See Plate 146). It differs considerably from the original *A. africanus* in the size and growth form of the plant and in the colour of the flowers. Soon this newcomer had usurped the rightful place of *A. africanus* which was made a variety or even a new species. Loddige publishes an excellent figure of *A. africanus* in his *Botanical Cabinet* (1817) No. 42 and describes it as a new species, *A. minor*. In the works of Kunth, Willdenow, Roemer and Schultes, species and varieties of *Agapanthus* were made, shuffled and interchanged. Durand and Schinz in their *Conspectus Florae Africae* (1895) recognised three species while

Baker in the *Flora Capensis* (1897) holds the view that there is one species with four varieties.

In 1910 Beauverd described a new species of *Agapanthus* from the Transvaal. This was the first species to be described in which the flower has a long tubular perianth. Similar species which have since been published are *A. Weillighii* Hort. (1911), *A. pendulus* L. Bolus (1924) (See Plate 147), *A. Walshii* L. Bolus (1925) and *A. Hollandii* Leighton (1934). With the exception of *A. pendulus* in which the flowers are of a rich purple all these species have deep blue flowers.

All other members of the genus so far as it is known at present have flowers in which the perianth segments spread out from the apex of the tube and are as follows:—*A. africanus* (L.) Hoffmegg (1824), *A. campanulatus* Leighton (1934), and *A. orientalis* Leighton (1939).

The species which is usually grown in gardens is *A. orientalis* Leighton which flowers in summer and is very decorative. As well as the varying shades of blue there is a form of this species with pure white flowers which has never been found in the wild state and would seem to be a mutant. Many of the smaller forms such as *A. longispathus* Leighton (See Plate 147) are becoming popular in South African gardens. They are less massive and give a better display of flowers than *A. orientalis* since the plants are small and many can be grouped in the space occupied by a single plant of *A. orientalis*. The species *A. africanus* which grows on Table Mountain and in other parts of the South Western Region of South Africa is less well known in cultivation but it is well worth growing for the deep violet-blue colour of its flowers. Some of the most attractive species both in form and colour are the undescribed species which are closely allied to *A. campanulatus* and which grow in Natal and the Orange Free State. Descriptions of these will appear as soon as further knowledge of them can be acquired.

Most species of *Agapanthus* are deciduous in Winter. In cultivation, however, where the climatic conditions are somewhat altered, this does not occur every year. The leaves usually die down after the flowers are produced. *A. orientalis* and *A. africanus* are exceptions in this respect as they remain evergreen.

In studying the genus *Agapanthus* it has been found that it is essential, for purposes of taxonomy, to work with plants which come from the field for plants respond very quickly to garden conditions and their growth is very luxuriant. In addition the species hybridise with one another.

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Nat'l Bot. Gardens, Kirstenbosch



See page 106

Agapanthus longispatus, left; *Agapanthus pendulus*, right, in the National Botanic Gardens, Kirstenbosch.
Plate 147

SOUTH AFRICAN AMARYLLIDACEAE DISCOVERED SINCE 1888

WINSOME F. BARKER,

National Botanical Garden, Kirstenbosch

Arranged according to Dr. Hutchinson's system—

AGAPANTHEAE

AGAPANTHUS L'Her.

1. *Agapanthus caulescens* Spreng. (1901).
2. " *inapertus* Beauv. (1910).
3. " *Weilligii* Hort. (1913).
4. " *Walshii* L. Bolus (1920).
5. " *pendulus* L. Bolus (1921).
6. " *campanulatus* Leighton (1934).
7. " *longispathus* Leighton (1934).
8. " *Hollandii* Leighton (1934).
9. " *orientalis* Isaac (1939).

TULBAGHIA Linn.

1. *Tulbaghia natalensis* Baker (1891).
2. " *leucantha* Baker (1896-97).
3. " *Galpinii* Schltr. (1897).
4. " *campanulata* N. E. Br. (1901).
5. " *Simmleri* Beauv. (1909).
6. " *calcarea* Engl. & Krause (1910).
7. " *Luebbertiana* Engl. & Krause (1910).
8. " *tenuior* Krause & Dinter (1910).
9. " *pauciflora* Baker (——).
10. " *karasbergensis* Glover (1915).
11. " *Dieterlenii* Phillips (1917).
12. " *pulchella* Barnes (1930).
13. " *fragrans* Verdoorn (1931).

AMARYLLIDEAE

BRUNSVIGIA Heist.

1. *Brunsvigia Insizwae* A. Zahlbr.
2. " *natalensis* Baker (1896-7).
3. " *sphaerocarpa* Baker (1896-7).
4. " *Rautanenii* Baker (1903).
5. " *Bosmaniae*, Leighton (1932).
6. " *appendiculata* Leighton (1932).
7. " *undulata* Leighton (1934).

NERINE Herb.

1. *Nerine pancratioides* Baker (1891).
2. " *appendiculata* Baker (1894).
3. " *angustifolia* Baker (1896-7).
4. " *brachystemon* Baker (1896-7).
5. " *duparquetiana* Baker (1896-7).
6. " *Schlechteri* Baker (1903).

7. " *Huttonii* Schonl. (1903).
8. " *Bowdeni* W. Watson (1904).
9. " *Veitchii* Hort (1911).
10. " *Ridleyi* Phillips (1913).
11. " *pusilla* Dinter (1914).
12. " *Frithii* L. Bolus (1921).
13. " *Masonorum* L. Bolus (1930).
14. " *angulata* L. Bolus (1930).
15. " *Krigei* Barker (1932).
16. " *falcata* Barker (1933).
17. " *gaberonensis* Ober. & Brem. (1935).
18. " *Peersii* Barker (1935).
19. " *tulbaghensis* Barker (1935).
20. " *Breachiae* Barker (1935).
21. " *alta* Barker (1935).
22. " *filamentosa* Barker (1935).
23. " *gracilis* Dyer (1937).
24. " *hesseoides* L. Bolus (1938).

CRINEAE

CRINUM Linn.

1. *Crinum acaule* Baker (1896-7).
2. " *Menyharthi* Baker (1901).
3. " *amboense* Baker (1903).
4. " *nerioides* Baker (1903).
5. " *ondongense* Baker (1903).
6. " *polyphyllum* Baker (1903).
7. " *crispum* Phillips (1934).

AMMOCHARIS Herb.¹

1. *Ammocharis coccinea* Pax. (1889).
2. " *Taveliana* Schinz (1890).
3. " *Herrei* Leighton (1932).

CYRTANTHUS Ait.

1. *Cyrtanthus parviflorus* Baker (1891).
2. " *Galpinii* Baker (1892).
3. " *O'Brieni* Baker (1894).
4. " *Elliotii* Baker (1896-7).
5. " *Flanaganii* Baker (1896-7).
6. " *rectiflorus* Baker (1896-7).
7. " *stenanthus* Baker (1896-7).
8. " *leucanthus* Schltr. (1898).
9. " *inaequalis* O'Brien (1905).
10. " *Junodii* Beauv. (1907).
11. " *Thorncroftii* C. H. Wright (1910).
12. " *epiphiticus* J. M. Wood. (1913).
13. " *staadensis* Schonl. (1914).
14. " *suaveolens* Schonl. (1914).
15. " *contractus* N. E. Br. (1921).
16. " *Guthrieae* L. Bolus (1921).

¹The genus is being revised by G. Milne-Redhead and H. G. Schweikerd.

17. “ *rotundilobus* N. E. Br. (1921).
18. “ *Stayneri* L. Bolus (1925).
19. “ *rhododactylus* Stapf. (1929).
20. “ *Balenii* Phillips (1929).
21. “ *Fergusoniae* L. Bolus (1931).
22. “ *flavus* Barnes (1931).

ZEPHYRANTHEAE

GETHYLLIS Linn.

1. *Gethyllis pusilla* Baker (1896-7).
2. “ *multifolia* L. Bolus (1929).
3. “ *unilateralis* L. Bolus (1929).
4. “ *linearis* L. Bolus (1929).
5. “ *grandiflora* L. Bolus (1929).
6. “ *longituba* L. Bolus (1929).
7. “ *campanulata* L. Bolus (1929).
8. “ *lanuginosa* Marloth (1931).
9. “ *setosa* Marloth (1931).
10. “ *verrucosa* Marloth (1931).
11. “ *lata* L. Bolus (1932).
12. “ *Herrei* L. Bolus (1933).

HAEMANTHEAE

HESSEA Herb.

1. *Hessea Schlechteri* Kuntze (1893).
2. “ *bachmanniana* Schinz (1896).
3. “ *brachyscypha* Baker (1786-7).
4. “ *Leipoldtii* L. Bolus (1930).
5. “ *Mathewsii* Barker (1931).
6. “ *Karooica* Barker (1935).
7. “ *unguiculata* Barker (1935).

STRUMARIA Jacq.

1. *Strumaria bidentata* Schinz (1896).
2. “ *Watermeyerii* L. Bolus (1921).
3. “ *phonolithica* Dtr. (1923).

BUPHANE Herb.

1. *Buphane longepedicellata* Pax (1889).

HAEMANTHUS Linn.

1. *Haemanthus candidus* Hort. (1894).
2. “ *Nelsonii* Baker (1898).
3. “ *splendens* Dinter (1923).
4. “ *avasimontanus* Dinter (1923).
5. “ *otaviensis* Dinter (1931).
6. “ *sessiliflorus* Dinter (1931).
7. “ *sacculus* Phillips (1934).
8. “ *Nortieri* Isaac (1937).

EUCHARIDEAE.

- Klingia namaquensis* Schonl. (1919).

CHANCE MEETINGS WITH AMARYLLIDS IN FOUR CORNERS OF
THE SOUTH AFRICAN VELD

I. C. VERDOORN,

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In July 1936, two colleagues and I made a swift botanical trip through Swaziland and Zululand. The days usually found us in the hot, low plains and valleys where our progress was constantly being arrested by exceptionally interesting species in the vegetation. As the night approached we would anxiously consult map, speedometer and watches for we must get to the "next place with an hotel" by 8 o'clock, the dinner hour limit in such places. There was no time during the daylight to spend in eating and drinking but by night we were always ready for our dinner! In these regions the "towns" which often consisted merely of an hotel, a police station and a couple of stores, are situated high in the mountains because of the heat and fever in the valleys. Such a place was the isolated Magut which we reached one night only just in time. The hotel was clean and pleasant. There was only one other guest besides ourselves. As we went in to dinner we were struck by the beauty of the unusual table decoration. It consisted of bowls of *Cyrtanthus Galpinii*! The lovely rosy perianths dusted finely with gold and borne erect on their pale green peduncles were an exquisite and unique sight. The proprietress said natives had brought bunches of these flowers to her in the morning. She did not know where they grew. A day or two after, when winding down from Nongoma to the Black Umfolozi, we saw them growing, scattered richly on some of the grassy slopes. A few specimens were gathered and they are now pressed and dried and lodged in the National Herbarium, Pretoria.

February of the next year found me surveying the grazing plots at the Grootfontein School of Agriculture, Middleburg, Cape Province. These plots lie in the open Karoo veld some distance from the School. In the late afternoon when returning from this camp I noticed, at some distance from the road and near the foot of a low range of hills, a spot of bright colour midst the prevailing light brown and grey-green aspect of the Karoo in late summer. I hurried across the veld and reaching the spot a truly lovely sight met my eyes, a group of *Brunsvigia Cooperi* in full bloom. Stout peduncles under a foot in height, rose directly from the ground and bore umbels of up to 40 flowers beautifully disposed on stiff 6 inch pedicels. The pedicels were suffused with the same colour as the flowers, a colour difficult to describe. In this particular patch it seemed to be deep red but in others which I saw later it seemed a dark rich pink. A representative specimen collected at this spot may be seen in the National Herbarium, Pretoria filling a whole herbarium sheet in spite of several amputations. The leaves which are 4-5 inches broad and 9-12 inches long, appear after the flowering period.

July 1937 found the three, who were east in Zululand the year previous, near the west coast of the continent in the wild and mountainous region of Namaqualand. During one of the stops near Stein-

kopf on a rocky outcrop rich in succulents, Dr. R. A. Dyer came across two lorate leaves. He immediately realised they could belong only to an amaryllid and I could practically sense HERBERTIA readers uppermost in his mind as he worked carefully and persistently until he had removed from its stronghold the strange bulb with thick bifarious scales. We treasured this plant through the rest of the trip and were rewarded when it flowered in the garden of the National Herbarium in the following March. As he "half suspected" it has proved to be an undescribed species of *Haemanthus*. The flowers appear before the leaves and are borne on a reddish peduncle about 4 inches long. The flowers and bracts which grow erect forming the paint brush type of umbel are red. Early next year the species will appear in *Flowering Plants of South Africa*, for which publication it has been figured and described.

My most recent chance-encounter with an amaryllid in the veld took place when a group of Biologists from the Netherlands were touring South Africa last year. I was fortunate enough to be one of the local party to accompany them into the northern Transvaal during October. We had crossed the Zoutpansberg range via the famous Wylies Poort, the thrill of the first Baobab, that grotesque tree *Adansonia digitata*, was over and we had travelled some miles through Mopane bush when suddenly there was a cry of "halt!" from the botanists. Close to the road among some dark rocks was a group of *Haemanthus sacculus*, a coloured illustration of which may be seen in *Flowering Plants of South Africa*, plate 431. The umbels of vivid colour and intricate design were like gems in that setting. It may be a beautiful amaryllid in cultivation but in its natural habitat it is superb. The leaves appear after the flowers. Two or three inflorescences were forced to leave this little colony and were put into the botanical presses. Now botanical specimens from this locality may be seen in one or two herbaria in Holland and also in the National Herbarium, Pretoria.

In the South African veld, no matter what the climate or soil, there is hardly a corner in which some species of Amaryllidaceae does not flourish.

NOTES ON GETHYLLIS

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The genus *Gethyllis* is one of the ornaments and at the same time one of the oddities of what Peattie truly calls "the incredible flora of the Cape." Twenty species have been described, of which only nine appear in the *Flora Capensis* (Vol. VI, 1896), the rest having been discovered since. Several others still await naming and description. Most of them grow in the south-western coastal belt, usually in sandy soil, but several are found on the Karroo and in Little Namaqualand. The name *Gethyllis* was evidently taken by Linnaeus from the Greek Gethullis

(latinized as *Gethyllis*) which is a diminutive of *gethuon*, meaning a leek. The long necks shown in our illustration of *G. afra* (the type for the genus) probably suggested "little leeks" to him. One can thus refer to them in general as Gethyllids, the anglicized version of the Greek plural "Gethyllides."

Looking through the material of this genus at the Bolus Herbarium, University of Cape Town, and the Herbarium of the South African Museum, there emerges a composite picture of *Gethyllis* as a white bud piercing the bare earth in the dry season, and opening soon after it emerges into a delicate star-like flower, pure white or flushed with pink, scented like jasmine, and about three inches across. There is no stalk to this flower; the petals spread out an inch or two above ground at the end of a long slender perianth-tube which arises deep down in the bulb. Each bulb forms only one flower, which lasts one or two days, then vanishes, leaving the earth bare again. Several months later the ground is pierced by the tip of a long club-shaped object, usually orange-coloured, with a semi-transparent skin, through which can be seen numerous seeds, the size of small shot, embedded in a soft pulp. This is the elongated berry of *Gethyllis*, which has grown up from deep down in the base of the bulb. Like the flower, it is strongly and deliciously sweet-scented. It is pleasant to the taste (somewhat like a mixture of banana and pineapple) and is eaten by birds and animals, the hard-coated seeds being thus dispersed.

The next event in this strange cycle is the appearance of a bunch of linear leaves, usually very narrow and of a dark polished green, and more or less spirally twisted. The bunchy effect is due to their being enclosed below in a strongly-developed sheath which is often conspicuously spotted with dark purple or brown. Their rudiments can be seen waiting down below if one pulls out the fruit, and they come up after the rains have well begun. With the advent of the dry season they wither and vanish, and the earth is bare once more till the starry flowers again pierce it and shed their fragrance abroad.

So individual a habit has *Gethyllis* that this general description is enough to enable one to recognise the genus in the field. In several species the flower is smaller, only about two inches across, (*G. afra* of our illustration, Plate 148, varies from two to three inches) while in the splendid *G. grandiflora* L. Bolus it may be over six inches in diameter. But in all cases it is stalkless and single, and sent up without attendant leaves. In that perhaps lies its special appeal, coming up as it does in the dry season like a promise of resurrection among the withered remains of the spring glory of the veld.

The Gethyllids show other interesting peculiarities. One is the presence of numerous stamens in some of the species, a characteristic unique in the *Amaryllidaceae*. Thus in *G. afra*, while occasionally there are just six ordinary stamens, it is much more usual for some or all of them to be duplicated or even broken into three or four by the division of the filament. Other species may thus form up to more than sixty stamens, arranged in six "parcels." Another peculiarity is the curious coating of lacerate scale-like hairs on the leaves of several species which

grow in drier regions, where even the rainy season has long spells of dry weather. There is however, always dew at night, and Dr. Marloth has shown by experiment that these elaborate trichomes absorb this dew very effectively. They are described and figured by him in "South African Gardening," Vol. 21, pp. 40-41, 1931, and "Berichte der Deutsche Botanische Gesellschaft," Vol. 44, pp. 448-455, Tafel XI, 1926.

But it is through its fruit that *Gethyllis* is best known to South Africans, and known under the name of "Kukumakranka," a word probably adopted from the Hottentots, to whom it was an important seasonal addition to their food supply. (The spelling varies and the meaning is not known). The fruit takes several months to develop down in the base of the bulb. The two species commonest in the south-west Cape, *G. afra* L. (the subject of our illustration, Plate 148) and *G. spiralis* L. f., flower in December-January, and their fruit begins to appear at ground level in the latter half of April, when the first rains have softened the ground. Its stalk elongates so that it is gradually pushed up out of the bulb, looking like an orange-coloured finger poking straight up through the earth, till at length it flops over and lies flat. In *G. afra* it has then the appearance of a slender semi-translucent carrot (the broad end at the top), three to five inches long, with a delicious fruity scent. Thunberg said that this "resembled in some measure wild strawberries, and filled the room." But it is richer than the scent of strawberries, more like custard-apple (*Anona*) with a dash of port wine. The form and colour of this fruit and of the larger club-shaped fruit of *G. ciliaris* are shown in Marloth's "Flora of South Africa," on plate 35 of Vol. IV.

But before half its length has emerged it has probably been collected by the country children (and grown-ups) who scour the veld for Kukumakrankas in April and May. They hunt them both by sight and by scent, and far-seeing youngsters will have taken the precaution of surrounding each flower in December with a ring of stones. They eat them, or press and dry them as a present for their mothers, to use like lavender to scent handkerchiefs or linen-cupboard; or sell them to men to put into brandy, for several left in a bottle for a few months give it a delicate liqueur-like flavour and aroma. This, or a draught made by steeping Kukumakrankas in boiling water, is considered a very good remedy for stomach-ache.

Several species of *Gethyllis* used to grow quite commonly in the neighborhood of Cape Town. The traveller Burchell in 1811 noted: "On Green Point, and on the Flats in the Neighborhood of Cape Town, grows a celebrated little plant, which still preserves its original Hottentot name, being known by no other than Kukumakranki. It has a flower much resembling the common *Colchicums* of our gardens, and has also a bulbous root, close to which is produced a long, yellow soft fruit, of the length and size of a lady's finger, its tip just appearing above the ground. The taste of it is somewhat pleasant, but its smell is delightful, having a perfumed odour of ripe fruit, for which it is chiefly valued. The children of Cape Town sometimes go out in search of kukumakrankies; and as it is difficult to find them, being very inconspicuous amongst the herbage,



E. J. Steer, South Africa

See page 117

Gethyllis afra, “*Kukumakranka*” or *Christmas Star*. *Approximately three-fourths natural size.*

they consider it a little triumph to return home with a few; and the kukumakranki season never passes unnoticed." (W. J. Burchell: Travels in the Interior of Southern Africa." Vol. I, pp. 55-56. 1822).

Now, alas, Kukumakrankas are rare round Cape Town and its suburbs, having been ousted by the spread of houses and of the imported wattles and pines, as well as the depredations of bulb-hunters. But they can still be found if one searches in the right place at the right time, and one such place is a common close to my home in the suburbs. This common, the resort of golfers, footballers, and cricketers, surrounded by houses and busy motor-roads, and crossed daily by scores of people, is one of the refuges of *Gethyllis afra*. It is about Christmas time that its perfumed stars dot the common, whence they have earned another familiar name, "Christmas Star."

I have observed the flowering of these plants for a number of years, and there is a rather entertaining precision about it. December is a dry month, but there is usually some rain about Christmas time. The flower buds seem to be formed by the middle of December, but they wait underground till rain gives them the signal to emerge, when they rush up, some overnight, others the next day, while a few laggards may go on appearing during the next few days. But each flower only lasts for a couple of days, and the whole lovely show is over within a week to ten days after the rain has given the signal for it to begin. This sensitive reaction of the bulbs to rain, once their normal flowering season has been reached, seems to be characteristic of the genus. Dr. Marloth in his "Flora of South Africa" (Vol. 4, p. 121) tells of six bulbs of *G. ciliaris* he had in cultivation; these had been dormant for four months, till one day in December there was a shower of rain; next day five buds had appeared above ground, opening a few hours after sunrise. (The sixth bulb, cut open, proved to be still without a bud). Nearly a hundred of these flowers, each representing a bulb, can be counted each year on the common. The bulbs are fortunately deep-seated, and though occasionally one sees that a passer-by, attracted by the beauty of the flower, has tried to scratch down through the sandy soil to the bulb, they never succeed. And each year as Christmas approaches the writer waits eagerly for rain, and in the dusk of the next day searches for the first Christmas Stars. (In the dusk, for to drink in their perfume it is necessary to literally prostrate oneself at the shrine!)

I wonder if members of the Amaryllis Society have ever tried growing *Gethyllis*. Perhaps a plant which produces only one flower a year, and that lasting only a couple of days, is rather a dubious horticultural proposition. But should anyone be attracted by this odd plant, they would probably find it easy to cultivate, as it has been grown and flowered in Europe. *G. afra* was apparently described by Linnaeus from a plant growing over 200 years ago in Clifford's garden in Holland.

In Edwards' "Botanical Register," for 1826 (Vol. 12, plate 1016), appears a coloured plate of a plant in flower, grown by a London nurseryman, and Baker's "Handbook of the Amaryllideae" there is a record of one that flowered at Kew in 1887. Of *G. spiralis* there is a very good painting in "Curtis's Botanical Magazine" for 1808 (Vol.

27, plate 1088), again from a plant grown by a nurseryman near London; this is copied (reversed) in Mrs. Loudon's "Ladies' Flower Garden" (plate 184). Jacquin in his "Plantarum Rariorum Horti Caesarei Schoenbrunnensis" gives a fine painting (plate 79 of Vol. I, pub. 1797) of *G. ciliaris*, which had flowered in this Austrian garden.

In none of these paintings is the fruit shown, and possibly artificial pollination is necessary in cultivated plants; in their native home pollination is carried out by long-tongued moths. The time of flowering in Europe is variously given as June to August, and Curtis notes that "very few species are known in our gardens, and those have rarely bloomed." No wonder, with their constitution upset by being transferred as (presumably) mature bulbs to a climate where the seasons are reversed. With all South African bulbous plants grown in the northern hemisphere, the golden rule is to grow from seed, so that they can acclimatise themselves from the beginning. *Gethyllis* seeds germinate very easily, but how long they would take from seed to flower I cannot tell, for there is no record of this. Mr. Charles van der Riet of Stellenbosch, who has raised hundreds of seedlings during the last four years, tells me that his four-year-olds show only three or four leaves, and there is as yet no indication of their flowering.

South African botanists are very few in comparison with the multitude of problems raised by the vast and varied flora of their country, and there are many points in the life-history of *Gethyllis* about which they would welcome information. If any member of the Amaryllis Society has the patience to try growing one species from seed to fruit, keeping notes and drawings, he would earn the gratitude of his colleagues in South Africa. A deep pot of sandy loam would be suitable, and the only attention the plants would need is storage of the pot in a warm dry place during the winter months. In Florida they could presumably grow out of doors all the year round, unless the winter months (which would be the equivalent of our dry season) are very rainy.²

Our illustration (Plate 148) is from a photograph taken by Mr. E. J. Steer at Christmas time nearly thirty years ago. (One hastens to add that the bulbs shown had to be dug up to make way for a house). It has been used to illustrate a charming article on *Gethyllis afra* by Dr. L. Bolus in her "Second Book of South African Flowers," and I am much indebted to author and illustrator for permission to use it here, and to Dr. Bolus, and to Mr. Pillans of the Bolus Herbarium, for information about *Gethyllis*.

²The Florida winter months are relatively dry.—Ed.

AMARYLLIS KROMERII SP. NOV.

Bulbs of an amaryllid gathered July 1899 by Mr. Kromer or one of his employees in Brazil were sent to Arthington Worsley at Isleworth by Mr. Kromer from the Roraima Nursery Gardens, W. Croyden, in flower, April 1901. These bulbs flowered again in February 1903. Comparison of the blooms with other species indicated that this constituted

a new species of the Genus *Amaryllis*. The species was named for Mr. Kromer, and is allied with the *Amaryllis organensis* group, especially with *Amaryllis correiensis* (Bury fig. 9). It shows some possible alliance with *Amaryllis procera* in the resemblance to the rhododendron-like markings that are to be noted on the segments, but in general the coloration of the flowers most nearly resembles that of *Amaryllis correiensis* although not so brilliant.

Description.—*Amaryllis Kromerii* sp. nov.,³—Bulb medium sized or rather small with produced neck; leaves 4 to 5, glaucous, indistinguishable from those of small forms of *Amaryllis psittacina*, except in not having blunt apices, and in having the narrow pinkish cartilaginous edges of *Amaryllis correiensis* and *Amaryllis procera*; flowers a pair, regular, mostly red, rosy and green, copiously spotted externally towards the base with red on the green ground-color, suddenly dilated close to the nectary thus giving a campanulate effect to the flower; tube very short, naked, but quite closed up by the basal parts of the stamens; stamens somewhat spreading; ovules very numerous; fruit and seeds unknown.

Habitat.—Banks of Upper Rio San Francisco, highlands of Minas Geraes, Brazil.

Type material.—None available; description was made from living plants by Arthington Worsley at Isleworth, England, in 1903.

—Arthington Worsley.

³*Amaryllis Kromerii* sp. nov. aff. *A. organensis*; bulbus mediocris vel parvus, collo producto; folia 4 vel. 5, glauca, marginibus cartilagineis angustis incarnatis; flores gemini actinomorphi; perianthium rubrum, incarnatum et viridis, basi externe viridi dense rubromaculatum, nectarium versus dilatatum, tubo brevissimo nudo, intus clauso, squamellis circa filamentorum basin amplis patentibus; ovulae numerosae; fructus et semina ignota.

WORSLEYA, SUBGENUS NOV., GENUS AMARYLLIS (LINN. EX PARTE) AMARYLLIDACEAE

HAMILTON P. TRAUB,⁴ *Florida*

Amaryllis procera, the so-called Blue Amaryllis, is of great interest to the plant breeder on account of its beautiful lilac-colored flowers. However, all attempts to cross it with the other species of *Amaryllis* have apparently failed. This fact and other peculiarities of this plant to be taken up later have led to a reconsideration of its position in the classification of the species of the Genus *Amaryllis*.

The species was first described by Duchartre in 1863 from plants sent to him by M. Binot from Brazil. The latter had suggested the name "Impératrice du Brésil", but this was not in harmony with the rules of botanical nomenclature. Duchartre first proposed the name *Amaryllis gigantea*, but he found later that this name had been used

⁴The writer wishes to acknowledge with thanks the loan of photoprints from Mr. Wyndham Hayward.

by van Marum in 1805 to designate the plant that later was named *Brunsvigia gigantea* (van Marum) Traub [= *Amaryllis gigantea* van Marum;= *Amaryllis Josephinae* Redouté;= *Brunsvigia Josephinae* (Redouté) Gawl.] He therefore proposed the name *Amaryllis procera*. Up to 1929, there was no published description of the seed character of *Amaryllis procera*. Mr. Arthington Worsley made a special trip to Petropolis, Brazil, about 1925 to study this plant in its native habitat, and he wrote about his findings in 1929. He had previously flowered *Amaryllis procera* repeatedly at Isleworth, had set seeds on it by self pollination, and had raised seedlings. In his article (Gard. Chron. London. May 1929, pp. 377-379, figs. 188 and 189) he included illustrations showing the fruit and seed structure.

According to Mr. Worsley, the fruit dehisces in five months and contains 44 to 45 jet black D-shaped seeds. These are much thicker than in other species of *Amaryllis*, not at all winged, but very acutely angled, with all edges raised. He also notes that the gestative period is about two and one-half times as long as is the case in other *Amaryllis* species. These characters together with sickle-shaped leaves, and the failure to cross with other related species is used as a basis for proposing the new Subgenus *Worsleya*⁵ with *Amaryllis procera* as the type species.

The late W. Watson once proposed to Mr. Worsley that a monotypic Genus, named in his honor, be created to accomodate this species, but Mr. Worsley, being a very modest man, discouraged him. We agree with the late W. Watson, and propose that the new Subgenus be named in honor of Mr. Worsley who has done more than any other to bring *Amaryllis procera* into cultivation, and who was the first to figure the fruit and seed structure of this species, characters that are now used as the basis of the new Sub-group.

⁵**Amaryllis** subg. **Worsleya** subg. nov. Distinguit foliis falcatis, seminibus D-formibus, crassiusculis, apteris sed acute angulatis, marginibus elevatis. Typus: **Amaryllis procera** Duch. (Jour. Soc. Imp. Cent. D'Hort. 9:425-438.1863, t. 17.)

(L. van Houtte in Flore de Serres. 20:53-54, 1874, t. 2077-78; Traub and Uphof in Herbertia 5:128.1938, t. 112. Syn.: **Amaryllis gigantea** Duchartre (non van Marum), in Jour. Soc. Imp. Cent. D'Hort. 9:77.1863; **Amaryllis Rayneri** J. D. Hooker in Curtis's Bot. Mag. t. 5883.1871; **Hippeastrum procerum** Ch. Lemaire in L'Illus. Hort. t. 408.1864; W. Watson in The Garden, London, 1894, p. 350, t. 959; Worsley in Gard. Chron. London, May 1929, pp. 377-379, figs. 188 and 189.)

COOPERIA SMALLII

At last we have a yellow flowering species of *Cooperia* as a result of the botanical activities of Robert Runyon of Brownsville, Texas who sent bulbs of it, collected in southern Texas in 1930, to the late Dr. John Kunkel Small of the New York Botanical Garden. The publication of the species was apparently delayed on account of the death of Dr. Small. In April of the present year Dr. Alexander published the species *Cooperia Smallii*, named in honor of Dr. Small, in Addisonia (21: 7-8, t. 676, Apr. 1939):

Description—"Small's *Cooperia* is a scapose, bulbous herb, the bulb seated some two or three inches underground, obovoid, about an inch

(Continued on page 135)



H. H. Hume

Plate 149

Zephyranthes bifolia (Aublet) Roemer

See page 122

ZEPHYRANTHES OF THE WEST INDIES

H. HAROLD HUME

That a plant, placed from time to time in the genus *Zephyranthes*, was present in the West Indies became known as early as the end of the seventeenth century. Carolus Plumier, on one of his voyages to America of which he made three, visited the island of Santo Domingo and found a species that has been placed rightly or wrongly as *Z. bifolia*. He furnished a manuscript description (1689-1697) of this species beginning with the words, "Lilio narcissus bifolius purpureus". Gawler (1813) brought a second species to notice as "*Amaryllis tubispatha*" although he confused it with another plant from South America, the identity of which is doubtful, described by L'Heritier (1788) under the same name. Later Gawler's plant was transferred to *Zephyranthes* by William Herbert (1821) as the type or co-type of the genus. John Lindley added *Z. rosea* in 1824 and J. G. Baker described *Z. Wrightii* in 1888. C. H. Wright published a description of *Z. cardinalis* in 1914 from material that had come originally from a garden in the Bahamas. Now, it has been decided that this plant is identical with Plumier's plant from Santo Domingo. It is proposed to add *Z. insularum* and *Z. Plumierii* as new species to the West Indian list.

Of those named in the above chronology, *Z. bifolia* (Plate 149), *Z. insularum* (Plate 150), *Z. tubispatha* (Plate 153), *Z. Plumierii* (Plate 151), *Z. rosea* (Plate 152), and *Z. Wrightii* (Fig. 36), are regarded for the present as native. Besides these at least two other species of the genus, *Z. grandiflora* Lindley (*Z. carinata* Herb.) from Mexico and *Z. citrina* Baker (*Z. Eggersiana* Urban), first known from British Guiana but probably native elsewhere on the Central American-Mexican side of the Gulf of Mexico rim, are widely distributed as introduced species and highly regarded as garden plants. A few species belonging to related genera are also cultivated.

Species believed to be native in the West Indies present certain characters in common. In all six, the tubular portion of the spathe is shorter than the stipe, the stigmas elevated above the anthers are trifid, and the leaves are bright shining green in color. In these important particulars they form a homogeneous group. Distinctions by which they are to be set apart from one another must be sought in other characteristics than those indicated.

ZEPHYRANTHES BIFOLIA (Aublet) Roemer

Familiarum naturalium—synopses monographiceae 4:125. 1847.

Lilio narcissus bifolius purpureus, Bot. Am. descr. Mss. et ic. to 3, f. 137 in Bibliotheca Kewensis. 1689-1697.

Amaryllis bifolius Aublet. Historie des plantes de la Guiane Francaise. 3: 304. 1775.

Zephyranthes rosea Lindl. var. 2 *bifolia* Herb. Amaryllidaceae 173. 1837.

Zephyranthes cardinalis C. H. Wright. Botanical Magazine t. 8553. 1914.

Atamosco bifolia Britton. Flora Bermuda 79. 1918.

Atamosco cardinalis Britton. Flora Bahamas 78. 1920.

Habranthus cardinalis (Wright) Sealy. Jour. Royal Hort. Soc. 62:208. 1937.

Plate 149*

Bulb copiously rough-coated, dark, 2.5-3.5 x 2.5-4 cm., neck 3-12 cm. long, showing characters of dry land bulb; leaves 1-3, curved, concave on upper surface, apex tapered, shining green, 5.5 mm. x 11-35 cm.; scapes subterete or distinctly flattened, pink below, greenish pink above, 5 mm. x 8 cm.; spathe membranous, pink tinted, shorter than stipe, 2.5 cm. long, inflated larger than the stipe, tubular portion 1.7 cm. long, tips bilateral, slender, 8 mm. long; stipe slender, 2.5 cm. long; flower declined, broadly funnelform, cardinal red with small greenish throat, 6.5 cm. long; perianth tube green at base, green tinted upward, somewhat bluntly triangular, 1.6 cm. long; sepals cardinal red, spathulate, rounded at apex with prominent white cohering keels, margins incurved, 2 x 4.5 cm.; petals cardinal red, greenish tinted on inner surface towards base, ovate-spathulate, 1.8 x 4.2 cm., apex rounded, margins incurved; stamens declinate, attached below top of the tube; filaments slightly incurved, all six of nearly same length, white above, green tinted below, 2.5 cm. long; anthers yellow at anthesis, 6 mm. long; ovary short, 5 mm. long, bluntly triangular, bright green; style extending 1 cm. above anthers, thickened, upward, white; stigmas trifid, marked with 2 slight ridges, papillate, violet tinted, thickened, somewhat recurved, the ends rounded, 7 mm. expanded; capsule depressed above and below, deeply trilobed, lobes smooth, broad and rounded, 1.2 cm. long, 1.8 cm. wide; seeds black, shining, flattened, 3 x 7 mm.—Description based on fresh and dried material.

For many years after its discovery, apparently no reference was made to Plumier's plant until Fusée Aublet (1775) listed it and established the binomial *Amaryllis bifolius*. M. le Chevalier Lamarck (1783) described "Amarillis a deux feuilles" from a Plumier drawing and notes. William Herbert (1837) placed this plant as a variety of *Z. rosea*. Taking his information from previously published sources, M. J. Roemer (1847) described it as a doubtful species in the genus *Zephyranthes*. C. S. Kunth (1850) followed Herbert in placing it as a variety of *Z. rosea* and J. G. Baker (1888) also indicated his belief that such disposition was correct. No new information concerning this plant was added until Ignatius S. Urban (1907) wrote a new description from plants collected in the same general area in Haiti as that in which Plumier had first seen the species. Urban based his description on three sheets of specimens, Picarda 1087, Buch 366 and Buch 579 now in the Museum botanicum Berolinense.

*See also Plate 48, *Habranthus cardinalis*, Herbertia 4:72. 1937.

C. H. Wright (1914) described *Z. cardinalis* as a new species of *Zephyranthes* based upon material flowered at Kew, the bulbs of which had come indirectly from a garden in the Bahamas. His description is accompanied by a very satisfactory colored plate. Careful study of Wright's plate, his description, herbarium material from the same Bahama source, Florida Experiment Station No. 10731, U. S. National Herbarium 1556601, New York Botanical Garden Cultivated Plants No. 22632, No. 13095 and New York Botanical Garden Exploration of the Bahamas No. 268, and from Santo Domingo a large number of herbarium specimens, U. S. National Herbarium Nos. 1300281 1300830, 1148088, 1149489, 1149511, 1149876, 1453086, the three sheets cited by Urban listed above and E. L. Ekman *Plantae Indiae Occidentalis* No. 11929 in the Museum botanicum Berolinense and Plants of Haiti No. 8959 in the New York Botanical Garden Herbarium, brings to light that all represent the same plant and *Z. cardinalis* C. H. Wright passes as a synonymy. Moreover, the large stigmas, the rounded apices of the perianth and the declinate flower shown in Plumier's drawing, and his description leave no reasonable doubt that Plumier's plant, *Zephyranthes bifolia* (Aublet) M. J. Roemer and *Z. cardinalis* C. H. Wright are all the same plant and that it is native in Santo Domingo.

When all the characters of this plant are considered, it does not fit clearly into any genus now established. It differs from *Zephyranthes* in having stigmas that are quite broad and thickened, (not filiform, thread-like or lobed), in filaments that are slightly curved at the tips (not upright), in a definitely declinate flower, (not erect or sub-erect) and a spathe with bilateral tips (not unilaterally bifid). It differs from *Hippeastrum* in its tubular, inflated spathe (not two opposite single valves). Sealy (1937) has placed it in *Habranthus*, but it does not fit there exactly. It differs in its broad stigmas, its inflated spathe bilateral at the tips and in having filaments in two sets of lengths, not in four different lengths. For the present and until additional time and opportunity are afforded for study, it is here left in *Zephyranthes*.

It has been suggested that *Z. bifolia* (*Z. cardinalis*) may be an hybrid (Sealy 1937). Since the nativity of the plant has been established, there does not appear to be satisfactory basis for this assumption.

ZEPHYRANTHES INSULARUM n. sp. Plate 150

Bulbs subglobose, 2.5 x 2.7 cm., the neck 4.7-7 cm. long, dark brown, producing numerous offsets; leaves bright green, at first suberect, declinate when old, brownish near bases, 4-7 mm. wide, 9-21 cm. long, upper surfaces shallowly concave, under surfaces striated and slightly keeled, apex obtuse; scapes 1 or more, green, brownish pink toward base, subterete, slightly tapered upward, 3 mm. wide, 12-15 cm. long; spathe membranous, light green, tubular portion 1 cm., tips bifid, 1 cm., the whole two thirds as long as stipe; stipe light green, slender, 3 cm. long; perianth tube bright green, very short, 2-4 mm. long; bud light pink, blunt-pointed; flower declined, funnelform, 3.7-4.5 cm. expanded, 4.2 cm. long (ovary included), white, flushed pink on outside and green at base; sepals oval, 1.6-2 cm. wide, 3.8 cm. long, rounded at apex, white flushed pink along the center and toward apex on outside; petals white,



H. H. Hume
Zephyranthes insularum n. sp.
Plate 150

See page 123
The difference in the setting of the petals and sepals is noteworthy.

green at base, oval, rounded to apex, 1.8-1.9 cm. wide, 3.1 cm. long; stamens shorter than perianth; filaments incurved, green below, white above, 9 mm.-1.2 cm. long; anthers yellow, 1 cm. long; style green at base, white above, 2.5 cm. long; stigma white, trifid, slightly recurved, 4.5 mm. expanded; ovary trilobed, lobes rounded, 4 mm long.—Description based on fresh material secured from Key West, Florida and Santiago de las Vegas, Cuba.

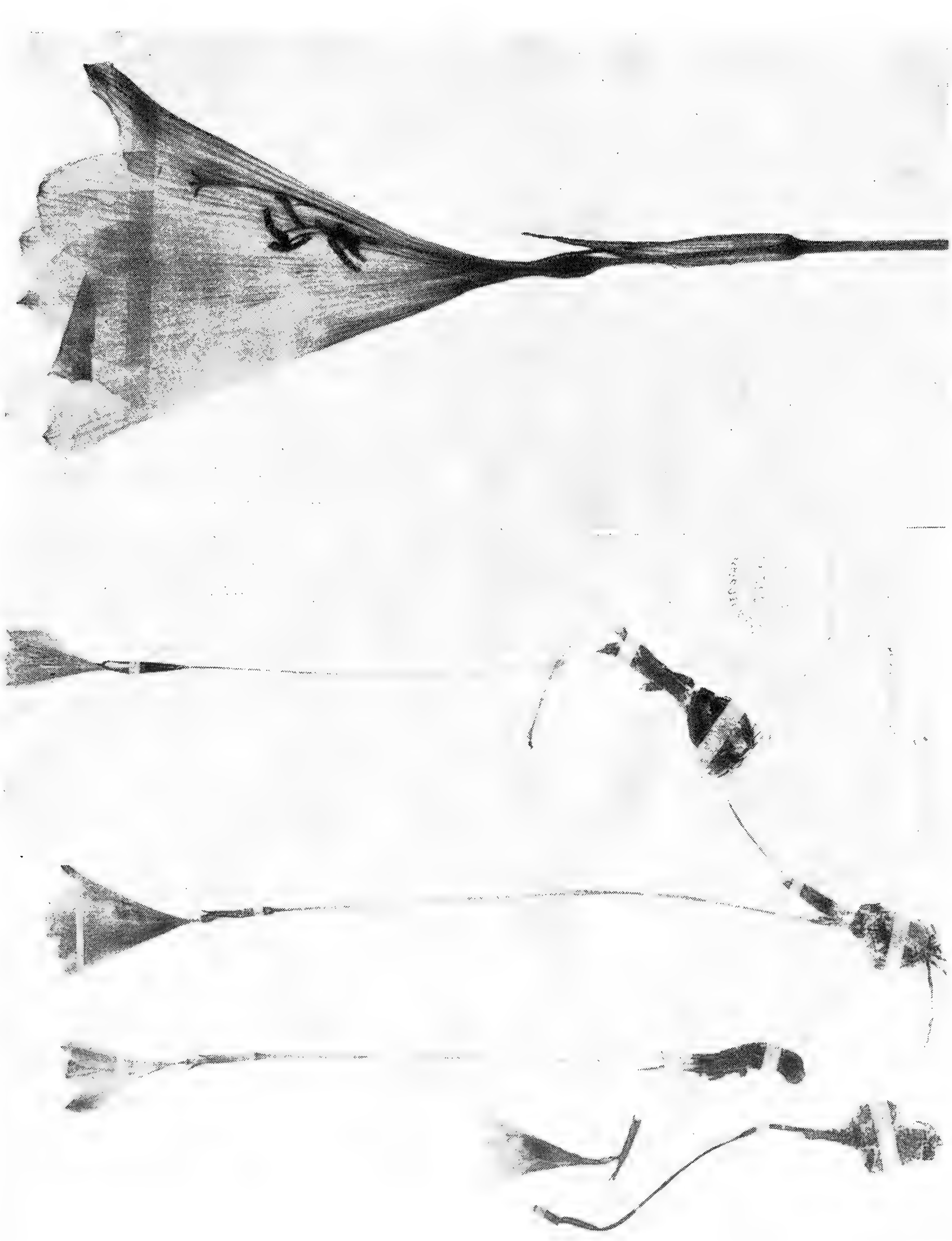
This interesting *Zephyranthes* was first observed May 9, 1935, in a garden in Key West, Florida. Immediately it was noted as distinct from all other white or whitish flowered species that had been studied. Since that time additional bulbs have been secured and these have flowered abundantly in the writer's garden and the first opinion has been confirmed. There is some reason to believe that this plant has passed as *Z. tubispatha* though in no instance has a specimen of it so labeled been found in any herbarium.

Later, through the kindness of M. Fortun, it was received from Cuba under the name *Z. tubispatha* from which species it is distinct. The flowers of *Z. tubispatha* are white at anthesis. *Z. insularum* the buds are pink and the three outer parts of the perianth are flushed with pink and this color deepens as the flowers fade. The segments in *Z. tubispatha* taper to a blunt point, while those of *Z. insularum* are rounded. Placed side by side in a fresh state, the flowers of one cannot be mistaken for those of the other. The perianth segments of *Z. insularum* stand out distinctly in two circles in the open flower and this character is accentuated as the flower ages. Those of *Z. tubispatha* appear as though in one circle.

Flowers of *Z. insularum* during the two days they are open follow a distinct rhythmic movement not so clearly observed in any other species. In common with other *Zephyranthes* their flowers open in the morning. The tips of the perianth segments are held together by the cohering keels (Hume 1937) on the three outer ones until all are fully developed. The buds expand until the pressure releases the keels whereupon the flowers open quickly to their full expansion with inner (petals) and outer (sepals) segments showing in two circles. In this condition they remain through most of the day. Toward evening the flowers close partially. On the second morning the sepals open practically as widely as on the first morning, but the petals do not. Instead they stand up by themselves separate and distinct from the three sepals. The appearance is of two flowers, a smaller inner one set within a larger outer one, each with three floral parts. With the coming on of evening the flowers close and do not open again.

Foliage of *Z. tubispatha* at 22°F. remained green and showed no cold injury; that of *Z. insularum* at the same temperature disappeared entirely.

Nothing is known concerning the native home of *Z. insularum*. It is not native in Key West; it may be native in Cuba. Relations between the two islands are close. In Key West *Z. rosea*, a Cuban plant, is also common in gardens and the two species are often found growing together. Both flourish in alkaline soil. *Z. insularum* is a most excellent garden subject.



H. H. Hume
Zephyranthes Plumieri n. sp. Type sheet U. S. National Herbarium No. 656,200. *Flora*
con Santo Domingo, H. von Tuerkheim No. 30 42, left; enlarged flower of *Z. Plumieri*, show-
ing marked difference in length of two sets of filaments, right.
Plate 151

See page 127

ZEPHYRANTHES PLUMIERII n. sp. Plate 151

Bulb globose to ovoid, thick-coated, dark brown, 2.5-3.5 x 3.5 cm., neck short, 1.5-2.7 cm. long; foliage sparse, leaves 1-3, linear-filiform, erect, 6-23 cm. long, 1.5 mm. wide; scapes slender, erect, 17-27 cm. long; spathe membranous, 3-4.3 cm. long, the tip usually subtending the ovary and sometimes the perianth tube, tubular portion 1.3-2.9 cm. long, tips erect, slender, usually fenestrate; stipe slender, 2.0-3.5 cm. long, usually hidden in the spathe; flower erect, broadly funnelform, 5-6 cm. long; perianth tube bluntly triangular, 2 cm. long; sepals not imbricated, spathulate or narrowly obovate, 1-1.3 x 3.5-4 cm. apex acute, prominently apiculate; petals spathulate, apex acute, 1 cm. wide, same length as sepals; stamens in two distinct sets, one set 6-10 mm. longer than other; filaments slender, short set 1.3-1.5 cm. long, long set 1.8-2.3 cm. long; anthers yellow 5-7 mm. long, slightly curved; ovary narrowly oblong, bluntly triangular in X-section, 3 mm. broad, 4-6 mm. high; style white, 4 cm. long, exceeding stamens by 6-9 mm., stigmas trifid, linear, 6-8 mm. expanded; capsule depressed above, bluntly triangular, 12 mm. high, 13 mm. broad. . . . Description based on herbarium material. H. von Türekheim, Flora von Santo Domingo No. 3042—U. S. National Herbarium No. 656200—is here designated as the type sheet.

A study of sheets of *Zephyranthes* in important herbaria has brought to light the existence of a species not heretofore recognized. It is native in the island of Santo Domingo. In all cases observed it has been labeled *Z. bifolia* and while some sheets represent the new species only, others have *Z. bifolia* and *Z. Plumierii* n. sp. on the same sheet. To this species are referred the following specimens: H. von Türekheim, Plantae Domingenses No. 3042 in Museum botanicum Berolinense and the same collector's number with a slightly different label in the New York Botanical Garden Herbarium. In the United States National Herbarium the following are listed as belonging here: No. 1077975 Constanza, Santo Domingo; No. 1273755 in part (two specimens center of sheet), Moncion, Dominican Republic; No. 1077991 Constanza, Santo Domingo; No. 1075238 in part (right hand flower), St. Marc, Haiti and No. 656200 H. von Türekheim, Santo Domingo. *Type*

The outstanding characteristic of the species is the marked difference in the length of the two sets of filaments. So great a difference occurs in no other West Indian species and it has not been noted elsewhere except in the case of the Mexican *Z. concolor* (Lindley) S. Watson.

This plant is named for Carolus L. Plumier, the early explorer for American plants.

ZEPHYRANTHES ROSEA Lindley
Botanical Register t. 821. Aug. 1, 1824

Atamosco rosea Greene. Pittonia 3:188. 1897.

Plate 152

Bulb small, smooth, dark-coated, producing offsets freely; leaves 3-6, bright green, linear, decumbent, 5 mm x 10-20 cm.; buds bright green; scapes 1-3, slender, terete, green, 2-3 mm. x 10-15 cm.; spathe thin, pink, 2.2 cm. long, about half length of the stipe, tips sharp-pointed, 1 cm. long; stipe 3.5 cm. long; perianth tube much abbreviated, greenish; flower broadly funnelform, tips rose pink with light throat, 3.5-4 cm. long, 3 cm. expanded; sepals rose pink in the upper portion, light colored or almost white below, oval to slightly obovate, gradually round-tipped to apex, 1.2 x 3-3.5 cm.; petals rose pink, oval to obovate, apex rounded, 1 cm. x 3-3.5 cm.; filaments white, 1.3 cm. long; anthers yellow, 7-8 mm. long; ovary faintly trilobed, 4 mm. long; style longer than the filaments, subtending anthers by about 1 cm., white below, light pink in upper portion; stigmas trifid, light pink, slightly reflexed, 5-6 mm. expanded; capsule short, rounded or broadly 3-lobed; seeds small, shining black, thick when fresh, 4-8 in number. Season late summer or early autumn in northern Florida. Description from fresh material.

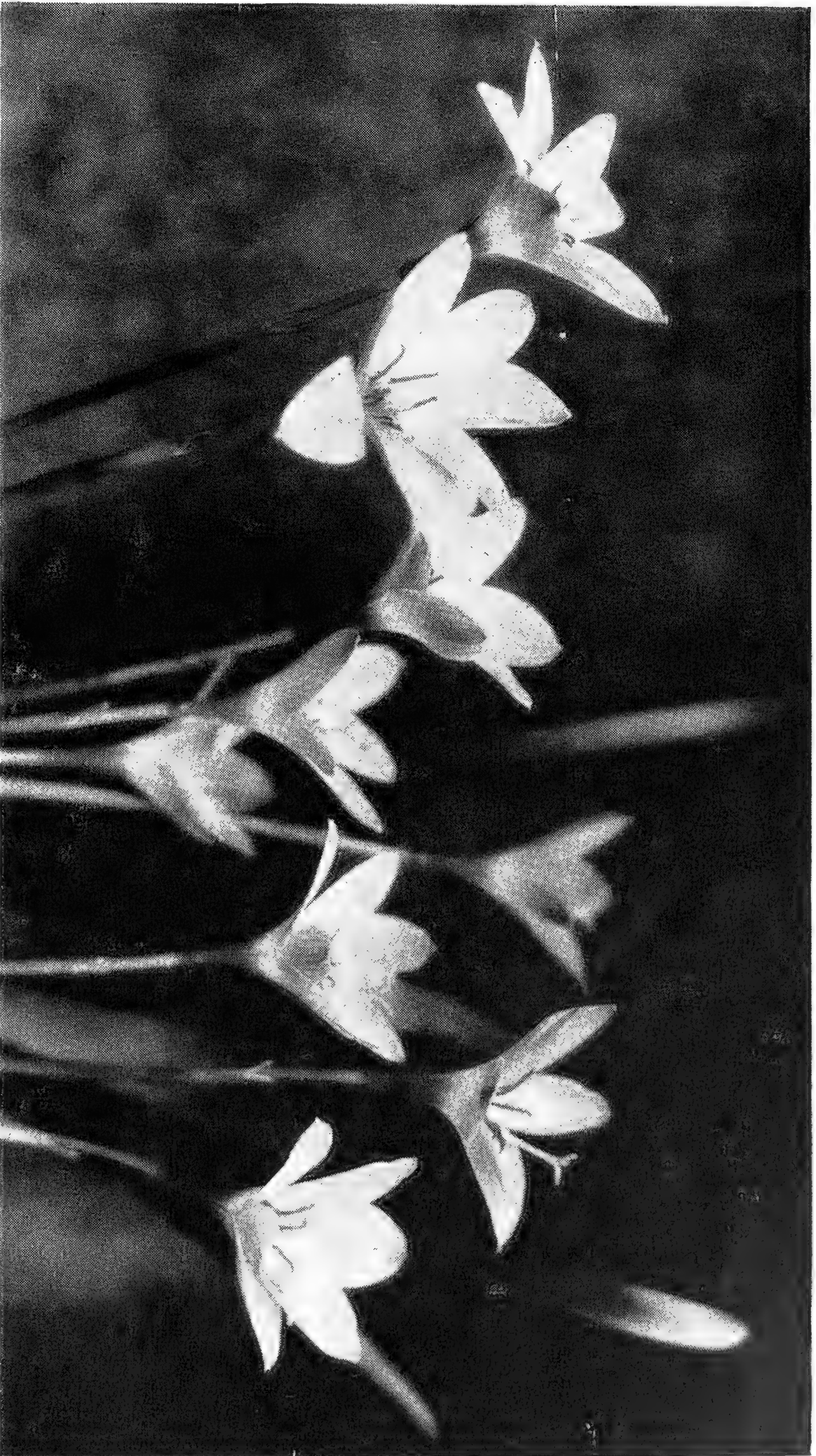
Bulbs of *Zephyranthes rosea* were collected at Havana, Cuba, by George Don who brought them to England in 1823 for the garden of the Royal Horticultural Society where flowers were secured in June, 1824. John Lindley (1824) published a description accompanied by an illustration. Seven years later William Herbert (1831) also published a description and an illustration.

Although regarded as native in the mountains of Cuba, *Z. rosea* is widely distributed as a cultivated and feral plant, particularly in the West Indies. Britton and Millspaugh (1920) report it from "New Providence and Grand Turk where it was observed carpeting a pasture over five acres in extent."

Its standing as a species has never been questioned nor has it been confused with other plants of the same genus. In its glossy green, round-pointed decumbent leaves, bright deep pink flowers of medium size, pink style, spathes about half as long as the stipes, and bulb propagation by abundant offsets, it is distinct from other species. Seeds in small numbers are usually produced.

Commonly it produces its first burst of bloom in late August or early September in northern Florida. In old well-established plantings, flowers may be so numerous as to cover the ground. Scattered flowers follow until stopped by cool weather, when the foliage also disappears for the winter.

Unfortunately in the bulb trade *Z. grandiflora* Lindley (*Z. carinata* Herb.) commonly is substituted for or sold under the name *Z. rosea*. So often is this the case that it is difficult to secure *Z. rosea* through usual trade channels.



H. H. Hume

Zephyranthes rosea Lindley

See page 128

Plate 152

Z. rosea is one of the daintiest and most beautiful of the genus. Two peculiarities in the plant are worthy of note. The leaves and scapes show no purpling toward the base, and the style and stigmas are tinted pink. It is a fine subject for both garden and pot culture.

ZEPHYRANTHES TUBISPATHA (Gawler) Herbert

Amaryllidaceae 171. 1837

Amaryllis tubispatha Gawler. Botanical Magazine t. 1586. 1813.

Plate 153

Bulb globose, 2.5-3.5 x 2.3-3.3 cm., rounded abruptly to the neck, neck 2.3 cm. long, tunics dark brown to black; leaves 3-5, linear, upright, edges thin, channeled on upper surface, rounded on lower, apices tapered, rounded and somewhat slightly keeled on underside, pink tinted at base, 4-8 mm. wide, 12-33 cm. long; buds greenish white, blunt-pointed; scapes light green, pink to pinkish brown at base, slightly subterete, 4-5 mm. x 12-15 cm.; spathe thin, membranous, violet gray-green, 2.7 cm. long, the tubular portion 1.2-1.7 cm., $\frac{1}{2}$ to $\frac{2}{3}$ length of stipe, tips slender, fenestrate or bifid, 1.5 cm. long; stipe light green, slender, 3.5 cm. long; perianth tube short, green, 4 mm. long, constricted at its union with ovary; flower funnelform, declinate, white with bases bright green within and without, 4.2-4.8 cm. long, 4.5-5.5 cm. expanded; sepals faintly striated, light green on lower third, oval, somewhat carinate, 1.7 x 4.5 cm., apex blunt-pointed; petals white, green about a third to half the length from base, oval, tapering to apices, 1.3-1.5 cm. x 4-4.4 cm.; filaments incurved, green tinted on lower third, white above, 1.1-2.0 cm. long; stamens in two sets differing about 7 mm. in length; anthers yellow, 6 mm. long; ovary green, bluntly trilobed, 4 mm. long; style declinate, light green at base, white above, 3.2-3.5 long; stigmas trifid, white, slightly recurved, 5 mm. expanded; capsule deeply 3-lobed, 8 x 7 mm.; seeds small, black, 4 x 5 mm.—Season in northern Florida May-June. Description based on fresh material.

As now understood, *Z. tubispatha* first became known in England from the description by Gawler (1813). He had secured a specimen which he illustrated and described from a Mr. Griffin of South Lambert, who in turn had received a bulb or bulbs from Jamaica and had flowered it in July 1813. In Jamaica it was said to grow "on one of the back settlements in the blue mountains of that island."

Gawler believed it to be the same as the specimen from Buenos Aires in the Commerson Herbarium that had been described under the same name by L'Heritier (1788). Later Herbert (1837) concluded that L'Heritier's plant was *Habranthus robustus* and placed *Amaryllis tubispatha* L'Herit. as a synonym. The specific name for Gawler's plant having been established, Herbert (1821) carried it over as *Z. tubispatha* when he transferred it to *Zephyranthes*. Baker (1888) concurred in this, and at an earlier date (1878) placed both *Amaryllis tubispatha* L'Herit. and *Habranthus robustus* Herb. as synonyms of *Hippeastrum tubispathum*.



H. H. Hume

See page 130

Zephyranthes tubispatha (Gaulter) Herbert

Plate 153

Strictly speaking, under the rules the plant which Gawler had in hand and which now passes under the name *Z. tubispatha*, was left by him without a name, as it was not identical with L'Heritier's plant. There may be some question concerning the identity of the L'Heritier specimen as the description is inadequate. However, since the genus in which it is now placed is a different one and no confusion can result, it is left as *Z. tubispatha*, a name that has been applied to it for more than a century. Incidentally it is worth mentioning that this plant may be regarded as the type species of *Zephyranthes*, since it was listed first under the genus when set up by Herbert.

Z. tubispatha is widely distributed as a garden and feral plant in the West Indies. Outside that area, it has on one occasion been secured from an old Florida garden and it has been received without name from Central America. No information is available to indicate exactly where it may be native, but its wide distribution in the West Indies supports the belief that it is or was, native somewhere in those islands.

The species is unusual in its coloring. Flowers of white zephyranthes usually either are tinged with pink or become pink tinted as they fade. Baker (1888) wrote of *Z. tubispatha*, "Perianth—white slightly tinged with green, never with red," an observation which appears to be entirely correct. However, when far advanced in fading a faint pink tint develops. In no living flowers at full anthesis and in no herbarium specimens of this species has pink or red color been observed by the author and large numbers have been examined.

ZEPHYRANTHES WRIGHTII Baker
Handbook Amaryllideae. 32. 1888.

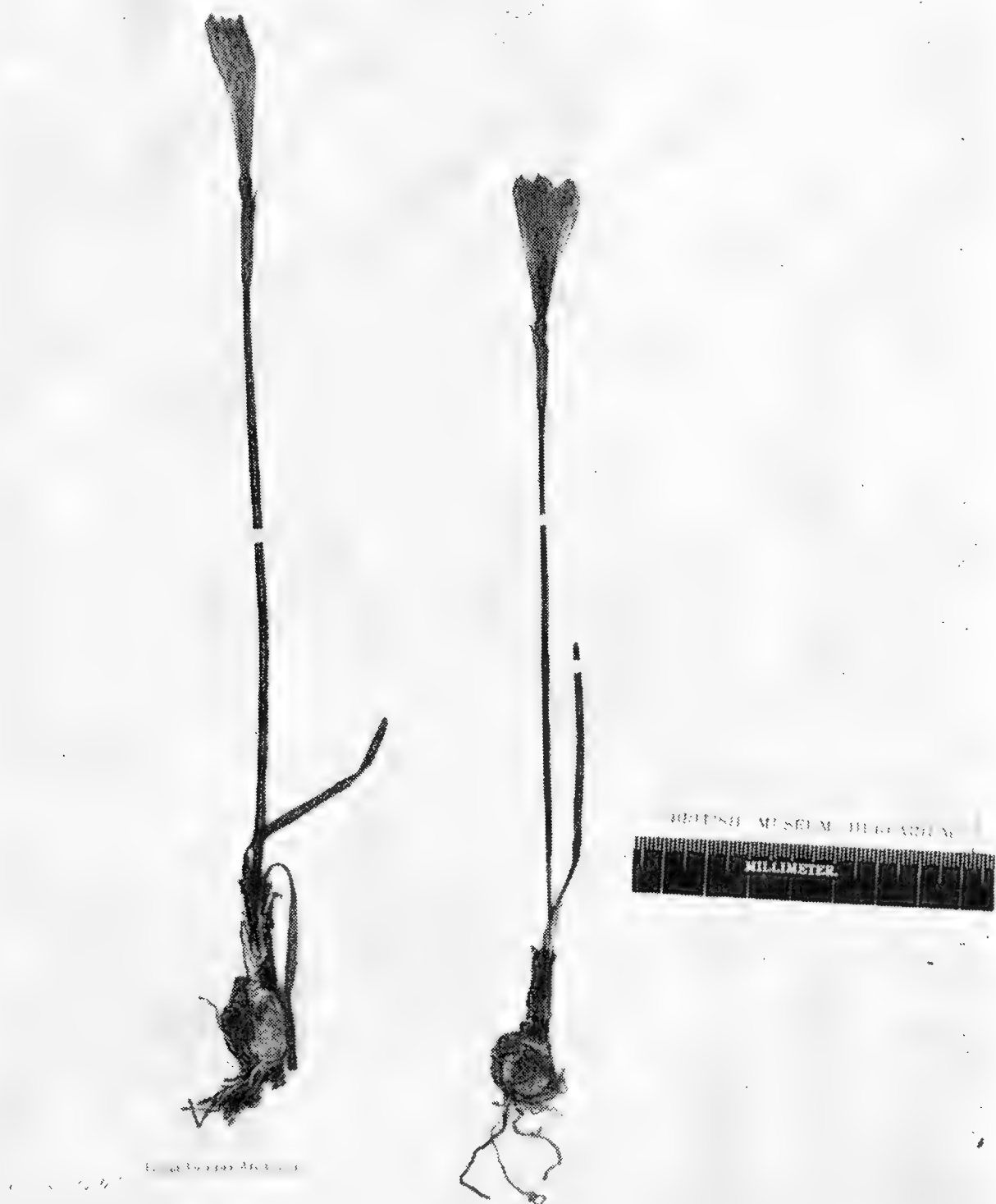
Zephyranthes cubensis Urban. Sym. Ant. seu Fund. Florae Indiae Occid. 292. 1907.

Figure 36

Bulb small, subglobose, dark brown, 1.5-2 x 1.8 cm., the neck short to medium, 1.5-4 cm. long, coats thin; leaves green, linear, slightly tapered, apex tapering, 2-4 mm. x 10-25 cm., erect; scape slender, terete, green, 1.5-3 mm. x 9.5-30 cm.; spathe light pink, membranous, 1.6-2.8 cm. over all, tubular portion 9 mm.-2.1 cm., tips bifid, 4-9 mm. long, shorter than, or usually about 2/3 as long as stipe; stipe slender, 2-4.5 cm.; flower pink, erect, 4-6 cm. long; perianth pink, funnelform, tube short, 4 mm. long; sepals elliptic-ovate, pink, 8-12 mm. wide, 3.5-5.5 cm. long, apex rounded or slightly tapered, blunt; petals pink, elliptic-ovate, slightly smaller than sepals; stamens much shorter than perianth segments; filaments in two sets nearly equal in length, slender, white, 1.8 cm. long; anthers yellow, linear, 8-10 mm.; stigmas trifid, white, linear, recurved, surmounting anthers by 1-1.2 cm., expansion 6-10 mm.; ovary ovoid, small, 3-5 x 4-6 mm.—Description based on E. L. Ekman No. 10734, Wright No. 3246 (Museum botanicum Berolinense), Baker & Dymmock No. 1847, A. H. Curtiss No. 452 and Wright No. 3247.

Locality: Cuba—Isle of Pines. Habitat: From the character of the bulbs, it grows in rather moist soils.

Charles Wright, the American plant explorer, spent eleven years (1856-1867) in Cuba collecting specimens for various herbaria. Near Herradura in the Province of Pinar del Rio, he collected specimens of a zephyranthes, No. 3247, from which J. G. Baker (1888) described the species *Z. Wrightii*. Six specimens of this number belonging to Wright's collections of the period 1860-1864, two on one sheet in the Herbarium of the Royal Botanic Garden, Kew, two on one sheet in the British Museum (Natural History) Herbarium, one sheet with one specimen in the Gray Herbarium (Harvard) and one sheet with one specimen in



H. H. Hume

Fig. 36. *Zephyranthes Wrightii* Baker. Type collection, Wright No. 3247 in the British Museum Herbarium.

the Museum botanicum Berolinense have been examined. These six specimens are unusually similar and are all that have been found of the type collection. They were distributed as the Mexican *Z. Lindleyana* Herb. from which, however, they are distinct. Careful examination also shows that they are different from other species of approximately the same color range known from the West Indies, native or introduced,

viz., *Z. rosea*, *Z. bifolia*, *Z. grandiflora*, and *Z. Plumierii* that from time to time have been found wild or cultivated in the West Indies.

Based upon Wright No. 3246 and Baker and Dymmock No. 4847 also from Herradura, Cuba, Ignatius Urban (1907) described *Z. cubensis* as a new species. Previously Baker (1888) cited Wright No. 3246 under *Z. grandiflora* Lindl. (*Z. carinata* Herb.) to indicate the wide distribution of that species as a cultivated plant. Urban in his description referred to this placement by Baker. Now it comes about that Baker had in hand Wright No. 3246 in the Herbarium of the Royal Botanic Gardens, Kew, which is *Z. grandiflora*, as he said it was, while Urban had another sheet of the same number, now in the Museum botanicum Berolinense, which is the same as Baker and Dymmock No. 4847 and Wright No. 3247, and which is not *Z. grandiflora*. Apparently Wright No. 3246 is a mixed distribution because two numbers in the U. S. National Herbarium, No. 933896 and No. 36466 (Wright's No. 3246) are *Z. rosea*. As a matter of fact, three species, *Z. Wrightii* (*Z. cubensis*), *Z. grandiflora*, and *Z. rosea* were mixed and distributed under Wright's No. 3246.

Fine specimens of *Z. Wrightii* were collected by A. H. Curtiss near Neuva Gerona, Isle of Pines, April 20, 1904, and widely distributed as *Z. rosea* under his No. 452. These show the range of size for the species from small specimens corresponding to those represented in Wright No. 3247 (Kew Herbarium, British Museum and Gray Herbarium) and No. 3246 (Museum botanicum Berolinense) up to those of much larger size.

Acknowledgment is hereby tendered to those Herbaria that have assisted in the preparation of this paper by lending many and valuable sheets: Cambridge Botanical Museum, Herbarium of Royal Botanic Gardens (Kew), Herbarium of the British Museum, Gray Herbarium (Harvard), Museum botanicum Berolinense, Herbarium of New York Botanical Garden, United States National Herbarium, and the herbaria of the Field Museum, the Missouri Botanical Garden and the University of California (Berkeley). Thanks are also due Lillian E. Arnold and Erdman West for assistance in the preparation of herbarium material of this group and other aid.

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(*Cooperia Smallii*—continued from page 119)

high and broad, white with a membranous brown coat. The leaves are bright green, one-sixteenth to one-eighth of an inch wide and six inches long, acute, channeled on the upper side, the underside rounded and several ribbed. The scape is erect, six to eight inches tall, slightly flattened, bright green and somewhat glaucescent, topped by a solitary flower. The spathe is membranous, an inch and a half long, greenish tan, entire and short acuminate at the apex, finely nerved. The flower terminates a stout pedicel an eighth to a fourth of an inch long. The ovary is cylindric, bluntly three-angled, and about three-eighths of an inch long. The perianth-tube is green, three-fourths of an inch long, abruptly expanded into the limb. The perianth is lemon-yellow, its divisions broadly ovate, the outer three segments slightly the larger, often flushed reddish, with a green rib outside near the apex which extends into a short green apiculate hood. The stamens are erect, the filaments subulate, about three-sixteenths of an inch long, greenish and fleshy; the anthers linear, pale yellow, about five-sixteenths of an inch long. The style is slender, about one inch long, green with a whitish apex. The three stigmas are globular and whitish. The capsule is strongly three-lobed, obovoid in outline, three-fourths of an inch long, the valves striate. The seeds are thin and wafer-like with a thin, glossy black coat."

THE TRIBE GILLIESIEAE OF AMARYLLIDACEAE

JOHN HUTCHINSON

Keeper of Museums of Botany, Royal Botanic Gardens, Kew.

When travelling in South Africa in the year 1928 I found growing on a moist rocky ledge in the Katberg a great quantity of *Agapanthus africanus* Beauv. I wondered then why this plant should not be included in the *Amaryllidaceae*, like the *Cyrtanthus Huttoni* Bak. which grew alongside, and I determined some day to look into the matter.

The opportunity did not come until some years later when I was making a study of the whole of the Monocotyledons for the second volume of my *Families of Flowering Plants*. I then became convinced that the character of the superior and inferior ovary to distinguish the *Liliaceae* and *Amaryllidaceae* was somewhat artificial, and that a much more homogeneous *Amaryllidaceae* would accrue from the use of the umbellate inflorescence as the distinguishing feature.

This involved the transference from the *Liliaceae* of most of the tribe *Allieae*, which embraced also the small South American subtribe *Gilliesieae*. In doing that I little thought that my action would bring me the honour of a Fellowship in the American Amaryllis Society, and later a request from the Secretary for a paper on the *Gilliesieae*. This I am glad to be able to accede to, but had it been for the whole of the tribe *Allieae*, in other words for an account of all the Onions, my loyalty not only to the Society, but to my own convictions of its taxonomic position would have been indeed strained to the utmost.

In Bentham and Hooker's *Genera Plantarum* the *Gilliesieae* were the third subtribe of the *Allieae* and were included in the family *Liliaceae*. It was distinguished from the other three subtribes by the stamens:—"Androecium valde obliquum vel uno latere tantum antheriferum."¹

At that time there were seven genera known, some of them very imperfectly. Even today we know very little more about the group, and only two additional genera have been described, these being *Speea* Loesner (*Geanthus* Philippi, non Reinw.), and *Schickendantziella* Spegazz. (*Schickendantzia* Spegazz. non Pax), both the original names selected for these genera having been used previously. There is thus an opportunity for those members of the Amaryllis Society who are interesting themselves not only in the acquisition of handsome and showy members of the family but also of botanical rarities. As I have pointed out in the notes accompanying some of the genera good herbarium specimens are very much desired and also material preserved in spirit. Bulbs for growing at Kew would also be very welcome and should be sent to the Director and not to me personally.

As a lengthy paper was published by Karl Reiche in Engler's *Botanisches Jahrbuch* in 1893², I shall give only a few generalisations relating to the group.

¹Bentham & Hooker f. *Genera Plantarum* 3: 750 (1883).

²Karl Reiche, *Beiträge zur Kenntnis der Liliaceae—Gilliesieae*, *Engl. Bot. Jahrb.* 16: 262-277 (1893).

As noted above the tribe *Gilliesieae* has hitherto been included in the *Liliaceae* because of the superior ovary. In all other respects, however, they agree with *Amaryllidaceae* (sensu stricto), where I have included them. Their most striking feature is the more or less zygomorphic androecium which gives the flowers of some of the genera a certain degree of obliquity. This is most highly developed in *Gilliesia*.

The inflorescence is always an umbel subtended by a pair of bracts. As a rule there are several flowers, but one genus is very advanced in this respect, *Speea*, where the umbel is reduced to a single flower as in the Snowdrop. Usually there are six perianth-segments, though rarely one pair are united (*Gilliesia*) and then there are seemingly only five, but in *Trichlora* the number is reduced to three. The presence of small corona-segments seems to me important and an interesting parallel with those higher *Amaryllidaceae* which have inferior ovaries. The filaments of the stamens are always more or less united, and the number of anthers varies from six to two, the sterile filaments being broader than the others and often almost petaloid. The gynoecium calls for no particular comment.

Nearly all the genera of *Gilliesieae* are found in Western Chile, but we know very little about their habitats in that region. Exceptions are *Trichlora*, from Peru, and *Schickendantziella*, from the Argentine. It is very often the case that plants peculiar to Chile are represented by closely allied genera or species in New Zealand and Eastern Australia, or even in California. But a review of the genera of both *Liliaceae* and *Amaryllidaceae* in these countries does not reveal any close relations, and therefore the tribe *Gilliesieae* stands apart as a very distinctive group.

KEY TO THE GENERA OF GILLIESIEAE

A. Corona absent:

B. Umbels long-pedunculate, several- to one-flowered:

C. Perianth-segments 6, subequal, united into a short tube.

D. Anthers short and rounded; leaf solitary; staminodes minute; style undivided ----- *Solaria*.

D.D. Anthers linear; leaves about 3; staminodes elongated, subequaling the perianth-segments; style divided ----- *Erinna*.

C.C. Perianth-segments 3, free:

E. Fertile stamens 6; stigma entire ----- *Schickendantziella*.

E.E. Fertile stamens 3 or rarely 4, the filaments partly united; stigma 3-horned ----- *Trichlora*.

B.B. Umbels sessile, 1-flowered; fertile stamens 6; perianth-segments equal, caudate-acuminate ----- *Speea*.

A.A. Corona present, composed of narrow scales outside the stamens:

F. Fertile stamens 6; filaments united into an oblique urn-shaped tube; perianth-segments subequal, acuminate *Miersia*.

F.F. Fertile stamens 3 or 2:

G. Perianth-segments equal sized, narrow, free; leaves very large (from descr. 1.5 m. or more long) ----- *Gethyum*.

G.G. Perianth-segments unequal, two sometimes united; leaves smaller than above:

H. Perianth-segments free; fertile stamens 3, with 3 staminodes, the staminal tube split down one side ----- *Gilliesia*.

H.H. Perianth-segments united into a short tube; fertile stamens 2, with 1 staminode ----- *Ancrumia*.

General References:—Baker in Journ. Linn. Soc. Bot. 17: 506-510 (1879); Benth. & Hook. f. Genera Plantarum 3: 804-6 (1883); Reiche in Engl. Bot. Jahrb. 16: 262-277 (1893); Krause in Engl. & Prantl, Pflanzenfam. ed. 2, 326-329 (1930).

DESCRIPTION OF SPECIES

SOLARIA Philippi in Linnaea 29: 72 (1857); Baker l. c. 509; Benth & Hook. f. l. c. 805; Reiche l. c. 271; Krause l. c. 326. Syn. *Symea* Baker in Saund. Ref. Bot. t. 260 (1871); *S. gilliesioides* Baker, l. c.

The rootstock is a fleshy corm, with a single linear leaf, a slender scape a few centimetres long, and 3-4 flowers in an umbel subtended by a pair of linear membranous bracts; perianth of 6 subequal green spreading segments; stamens 3, with 3 very minute staminodes; the ovary is immersed in the perianth-tube, and 3-locular; ovules 2 in each loculus; style as long as the ovary, not divided.

The type species, *Solaria miersioides* Philippi, is found in Chile, and was first collected by Germain at Santiago, and later by E. C. Reed. The genus was named in honour of Francisci de Borja Solar, of the Mathematical Faculty of the University of Chile. It was also described by Baker as *Symea* in Saunders Refugium Botanicum t. 260 in 1871, to commemorate the name of J. T. Boswell Syme, who edited the third edition of Sowerby's *English Botany*, and to connect his name with a family (*Liliaceae*), the European members of which he had for many years studied carefully under cultivation.

A second species, *S. major* Reiche, collected by Philippi at Canquenes in October 1867, is probably not distinct.

The morphology of the root system of this plant is interesting. The old corm is retained at the base of that of the current season and is a

smooth obvoid fleshy structure. The flowering corm is narrowly ovoid and enclosed with a similarly shaped funnel-like smooth thin sheath, from the top of which emerges the single leaf and scape. At one side of the base of the flowering corm is a mass of roots.

The solitary leaf distinguishes this genus from all others of the group.

ERINNA Philippi in *Linnaea* 33: 266 (1864); Baker l. c. 510; Benth & Hook. f. l. c. 805; Krause l. c. 326.

A monotypic genus, with a tunicated bulb, 3 radical leaves, a peduncle 12 cm. and a funnel-shaped shortly tubular perianth with 6 linear 1-nerved spreading segments; 3 perfect stamens with *linear* anthers on short filaments, and 3 sterile stamens reduced to filiform filaments; the flowers are several in an umbel, yellowish green, and subtended by 2 dry unequal-sized involucre bracts.

Only one species known, *E. gilliesioides* Philippi, from Chile; collected in the St. Ramon valley, in the Andes near Santiago.

Specimens of this species are much desired for herbaria, for there is none at Kew or the Natural History Museum, London.

SCHICKENDANTZIELLA Spegazz. in *An. Mus. Nacion. Buen. Air. Ser. 3*, 2: 8, in obs. (1903). Syn. *Schickendantzia* Spegazz. in *Rev. Fac. Agron. Veter. n. 23 & 24*, p. 386, (1896), et *Plantae Novae v. Crit. Reipub. Argent. Decas 3: 7* (1897), non Pax (1889).

This is known to me only from Spegazzini's description of which I give a translation:— . . . Bulbous, scapigerous, bibracteate, few-flowered, with a perianth of three free filiform elongated segments; androecium tubular, 6-lobed at the apex, lobes about equal and all bearing introrse bilocular anthers; ovary cylindric, 3-locular, ovules many; style rather long, crowned by a thickened entire stigma.

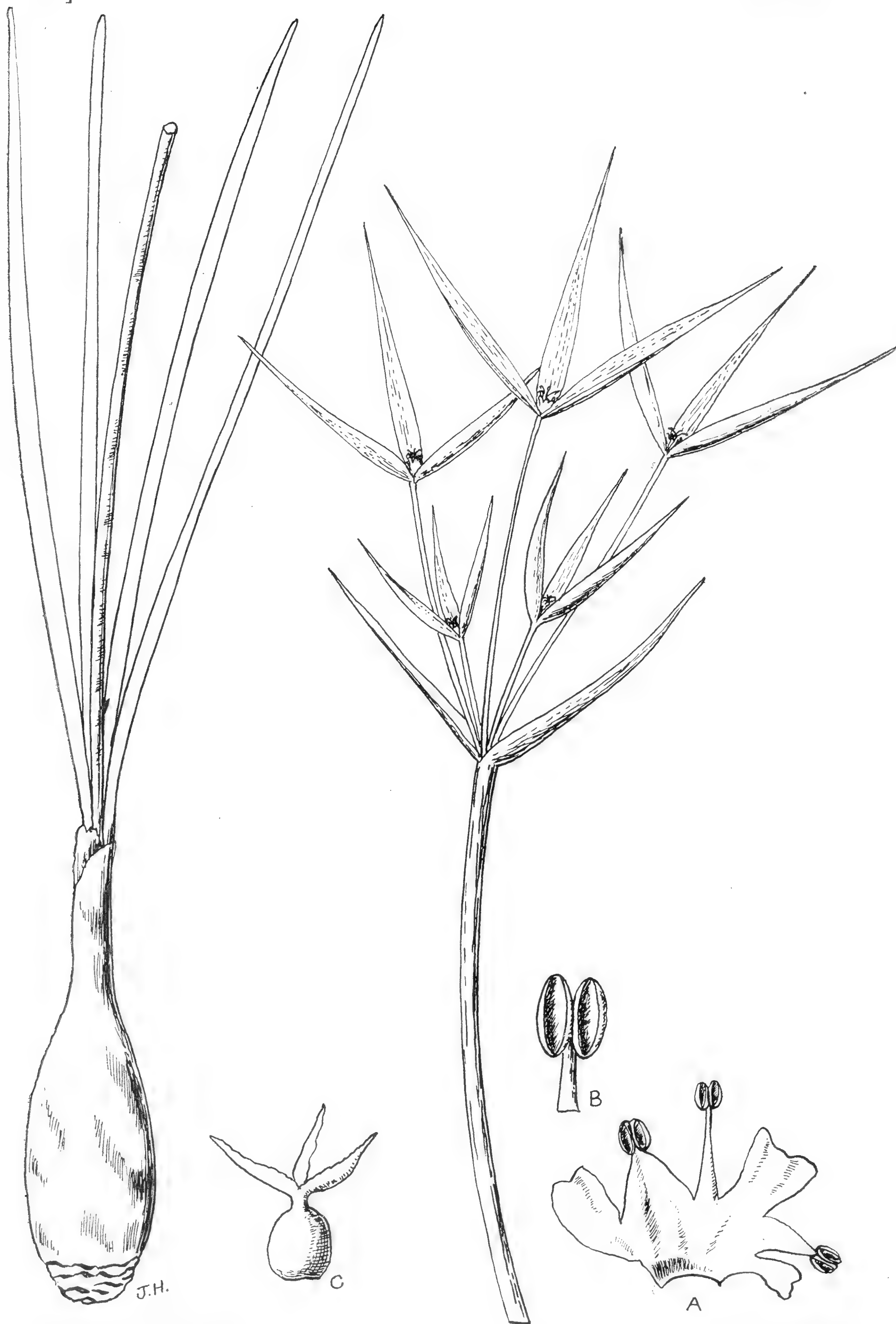
In the description of the solitary species, *S. tricosepala* (Spegazz.) Spegazz. The scape is said to be 1-2-flowered, the flowers nodding, and the margins of the base of the perianth-segments are violet and fimbriate, the filiform upper part being purple; the androecium is green and thin and encloses the ovary, the anthers are yellow and the style green.

Argentine: in fissures of rocks in *Alnus* woods in Tucuman Province.

This genus is not mentioned in Krause's account in Engler's *Pflanzenfamilien* ed. 2.

TRICHLORA Baker in Hook. *Ic. Pl. t. 1237* (1877); Baker l. c. 508; Benth. & Hook. f. l. c. 805; Reiche l. c. 272; Krause l. c. 326.

A peculiar monotypic genus with a narrow tunicated bulb; scales forming a narrow tube from the top of which emerge about 3 or 4 linear leaves and a slender scape bearing an umbel of about 5 flowers with 3 large lanceolate-acuminate green nearly free perianth-segments; the stamens are united into a tube irregularly split into 6 lobes, usually only 3 lobes bearing fertile anthers (See Plate 154); the style rather resembles the cyathium of a *Euphorbia*, with 3 spreading ligulate arms.



J. Hutchinson, Kew.

See page 141

Trichlora peruviana Baker

A, androecium spread out; B, anther; C, gynoecium. Drawn from a dried specimen in the Kew Herbarium; dissections enlarged.

One species, *Trichlora peruviana* Baker, (Plate 154) worth cultivating if only for the peculiar structure of its flowers. Found at Lima, in Peru, by Mathews, and in the Natural History Museum at South Kensington there is a specimen collected by Pavon.

MIERSIA Lindl. in Miers, Trav. 2: 529 nomen (1826); Bot. Reg. sub t. 992 (1826); Kunth Enum. Pl. 4: 486 (1843); C. Gay Fl. Chile t. 68 (1854); Baker l. c. 506; Benth. & Hook. f. l. c. 804; Reiche l. c. 274; Krause l. c. 328.

Corm ovoid, about 2.5 cm. long, with about 5 long-linear leaves and 1 or 2 scapes bearing 4-5 umbellate flowers subtended by 2 equal bracts; perianth-segments subequal, lanceolate, acuminate; corona of 6 narrow filament-like scales slightly adnate at the base to the staminal tube; stamens 6, the filaments united into an oblique urn-shaped body contracted at the mouth and bearing 6 small stipitate anthers beyond which the style just protrudes; ovary 3-locular, style a little longer than the globose ovary, with a small disk-like stigma; ovules several. Capsule truncate, slightly 3-lobed.

There are two species, both from Chile, *M. chilensis* Lindl. and *M. myoides* Bert., (the latter reduced to a form of *M. chilensis* by Reiche l. c.); the former is better known and is beautifully figured in Gay's Flora of Chile, quoted above. For those who are interested in floral structure this is a desirable species for cultivation. The most striking feature is the androecium, in which the filaments are united into an oblique tube giving the flower a zygomorphic appearance; on the inner rim of the tube the small anthers are shortly stalked.

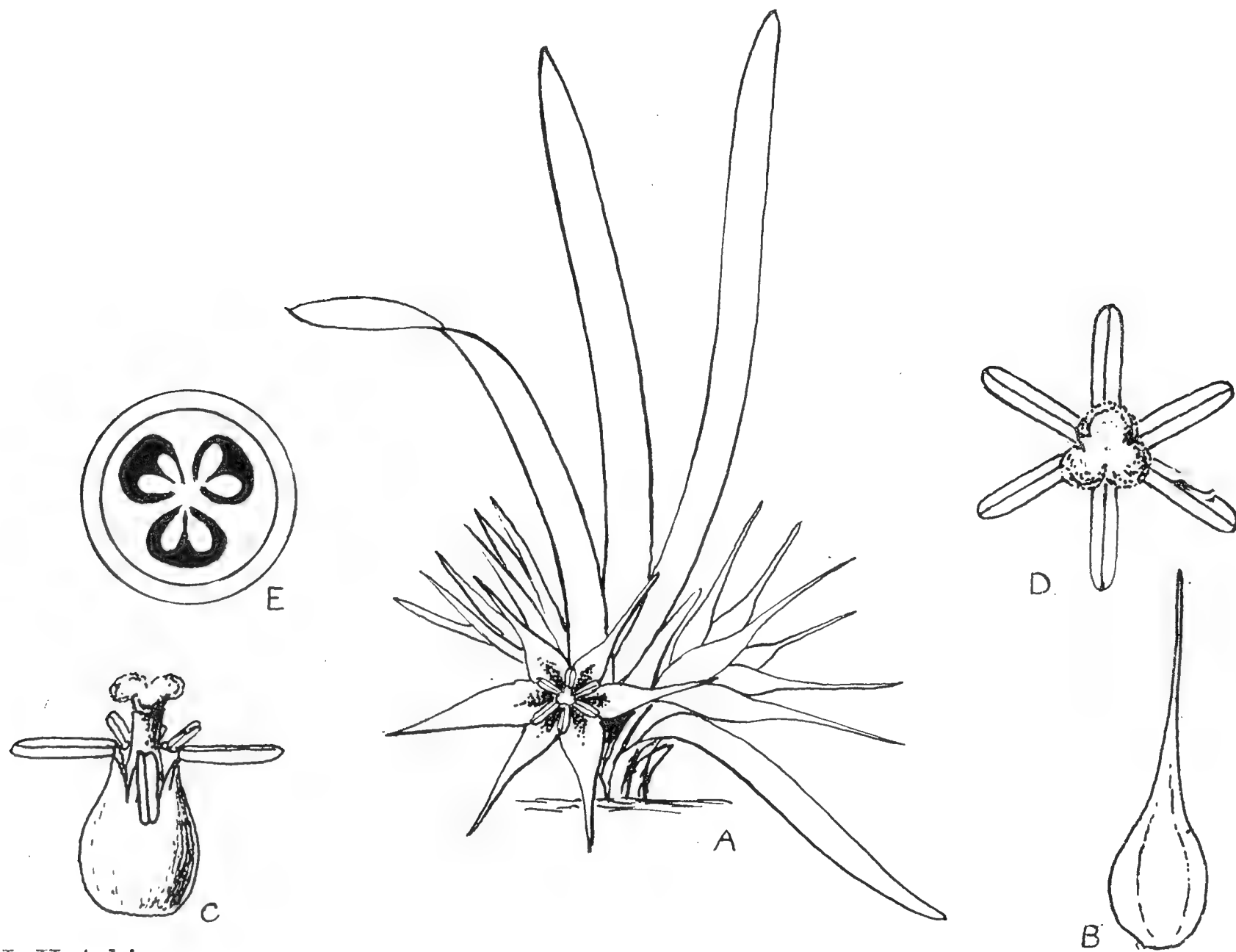
M. chilensis is recorded from the mountains near Valparaiso. Spirit specimens are desirable of genera such as these, as they do not dry very well.

SPEEA Loesner in Notizbl. Bot. Gart. Berlin 10: 63 (1927); Krause l. c. 326. *Geanthus* Philippi Descr. Pl. Nuev. Chil. (Reimpr.) 7 (1884), non Reinw.

Bulb grey, the size of a walnut; peduncles radical, 1-flowered, short, with one bract at the base of each, and each 1-flowered, appearing before the leaves; leaves 4, broadly linear, about 7.5 cm. long and 7 mm. broad; perianth-segments 6, 2-seriate, equal, broadly ovate at the base, abruptly long-acuminate, green, violet towards the base; stamens 6, monadelphous; filaments connate in a tube closely enveloping the ovary; anthers linear, pale violet, spreading horizontally and opening laterally; ovary 3-locular; ovules biseriate; style with a peltate thick obscurely lobed stigma, pale violet.

One species, *Speea humilis* (Philippi) Loesner ex K. Krause in Engl. & Prantl, Nat. Pflanzenfam. ed. 2, 15a: 326 (1930). Syn. *Geanthus humilis* Philippi l. c. (See Fig. 37).

Philippi tells an interesting story about the discovery of this genus in a letter to Sir Joseph Hooker in the Kew herbarium. "By a singular casualty I have discovered a new genus of Liliaceous plants, which grows in the cordillera of Santiago, and which offers very prominent characters. I had received during the last summer a lot of bulbs of *Phycella* and *Habranthus*, which I sent to several correspondents of mine; one was forgotten and I put it in a flower pot. My surprise was great, when in the beginning of August I noticed flowers coming out of the earth, first without any trace of leaves. During six weeks there came out about ten flowers and four leaves; unhappily not a single flower was



J. Hutchinson

Fig. 37. *Speea humilis* (Philippi) Loesner.—A, whole plant; B, perianth-segment; C, stamens and style; D, anthers and stigmas from above; E, transverse section of ovary. From a drawing by Philippi in the Kew Collection; dissections enlarged.

fertilized, and they all fell down, so that I can say nothing about the fruit and the seeds. My son suggested for this plant the name of *Geanthus humilis*, which I have adopted."

Unfortunately the name *Geanthus* had already been used by Reinwardt in 1823 for a genus of *Zingiberaceae* and now reduced to *Amomum*, so the new name *Speea* was provided by Loesner in honour of the German Admiral Maximilian Graf von Spee.

Accompanying the letter to Hooker was a coloured drawing by Dr. Philippi, and I give a black and white copy of it to give the reader some idea of this very remarkable genus. The inflorescence is apparently reduced to a single flower as in the common Snowdrop.

GETHYUM Philippi in Anal. Univ. Chile 43: 549 (1873); Baker l. c. 509; Benth. & Hook. f. l. c. 805; Reiche l. c. 273; Krause l. c. 328.

I have not seen a specimen of this genus which seems to stand out from its relations in having very large leaves (described as 5 ft. long and 1½ inch. broad); the bulb is tunicated, and the scape is elongated, with several flowers in an umbel, on long pedicels; and the perianth-segments dark-purple above the green base are very narrow and spreading, there are 6 violet corona-scales, and 3 perfect stamens united together with 3 sterile ones into a membranous sheath; ovary 3-locular; capsule globose, opening into the loculi at the apex; seeds black, smooth.

Described from a single specimen collected by Philippi at Peñalolen at the foot of the Cordillera of Santiago, in Oct. 1871.

If this rare plant be still in existence it would be very desirable to have it in cultivation and specimens preserved in spirit for herbarium purposes.

GILLIESIA Lindl. Bot. Reg. t. 992 (1826); Bot. Mag. t. 2716 (1827); Kunth Enum. Pl. 4: 487 (1843); Baker l. c. 507; Benth. & Hook. f. l. c. 804; Poepp. & Endl. Nov. Gen. et Sp. 2; t. 137 (1836); Reiche l. c. 275; Krause l. c. 328.

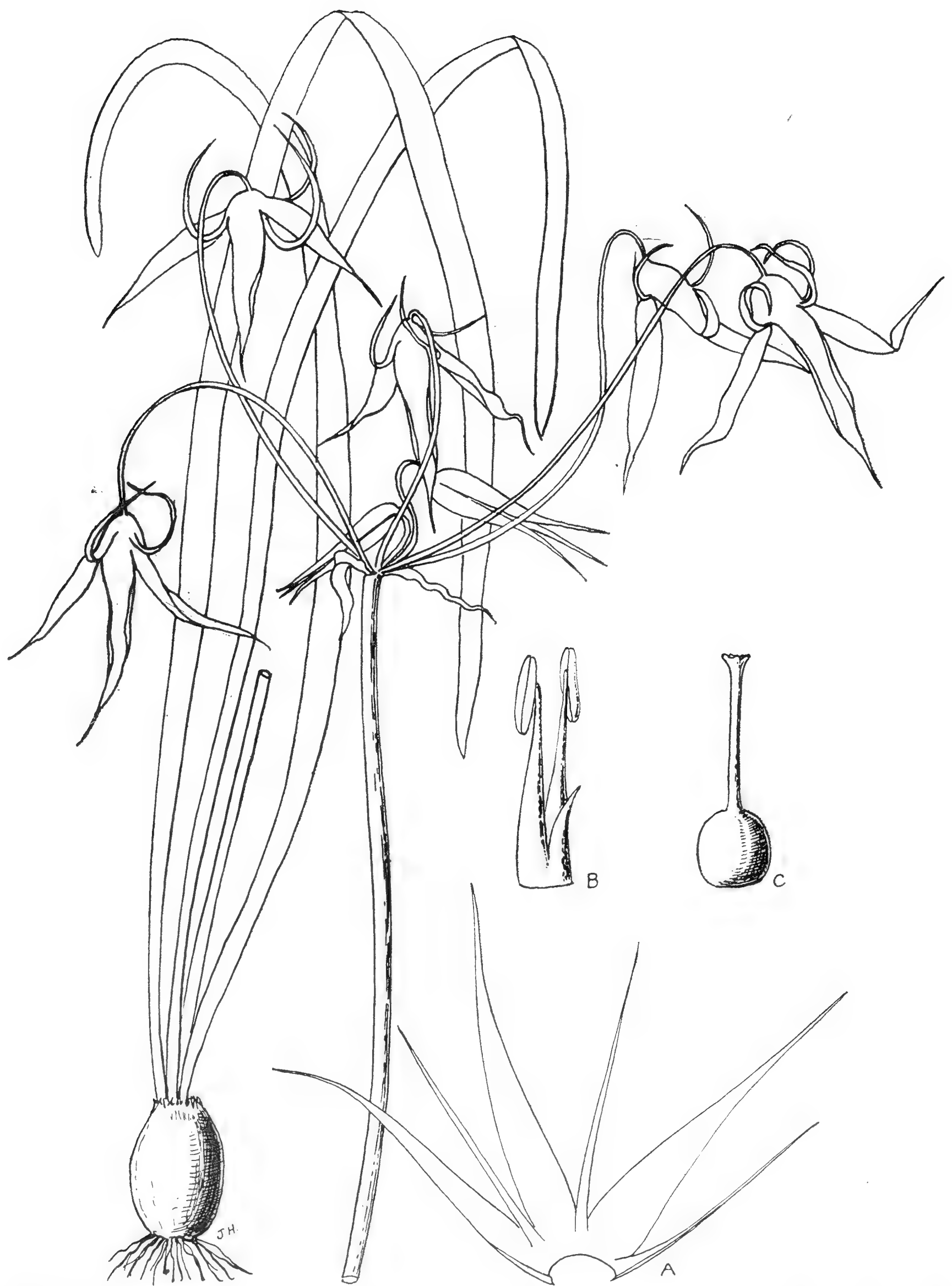
Bulb narrowly ovoid, covered with thin tunics; leaves usually 2, linear, very slender towards the base, about 10-nerved; scape very slender, longer than the leaves; umbel subtended by a pair of very unequal-sized bracts; flowers several (up to 9) on long slender pedicels; perianth-segments 6 (sometimes only 5), ovate, unequal-sized; corona of separate linear scales outside the staminal tube, the latter split at one side and bearing only 3 fertile anthers; ovary globose, 3-locular, style as long, minutely trifid; ovules several in each loculus; capsule ellipsoid, seeds smooth, black.

In this genus there is a corona of narrow scales outside the staminal tube; the latter is very remarkable, being split on one side to the base, the lobes bearing only 3 fertile anthers. This and the occasional union of a pair of the perianth-segments gives the flower a very zygomorphic appearance.

The type species is *G. graminea* Lindl., a native of Chile, and recorded from Valparaiso, Cuesta de Chacabuco, and Catapilco.

According to Reiche there are three other species, *G. montana* Poepp. (Nov. Gen. 2, t. 138), from the Antuco Volcano in South Chile; *G. Gaudichaudiana* Kunth (Enum. Pl. 4: 391); from Valparaiso; and *G. monophylla* Reiche, from Constitución. Of the last mentioned there are two forms, *atropurpurea* and *viridescens*. I am very doubtful if there are so many species as made out by Reiche, however, the differences given being very slender.

ANCRUMIA Harv. ex Baker in Hook. Ic. Pl. t. 1227 (1877); Baker l. c. 510; Benth. & Hook. f. l. c. 806; Reiche l. c. 273; Krause l. c. 329.



J. Hutchinson, Kew

See page 143

Ancrumia cuspidata Harv.

A, perianth opened out; B, androecium; C, gynoecium. From a drawing by John Buchanan in the Kew Collection; dissections enlarged.

A tall plant about 35 cm. high, with 1-2 long narrow linear leaves from an ovoid bulb; the flowers are several in the umbel, which is subtended by a pair of slightly unequal bracts, and are nodding, pale green and stained with purple at the base; pedicels very long and slender; perianth segments 6, connate at the base into a campanulate tube, the outer segments (about 4 cm.) narrowly lanceolate and subpatent, papillose inside, the inner much narrower and shorter and recurved; stamens 2, monadelphous, with the rudiment of a third filament; anthers oblong; ovary 3-locular, enveloped by the staminal tube; style with a triquetrous stigma; capsule 1 cm. long, valves emarginate; seeds subglobose, black, with a large straw-coloured funicle.

One species, *A. cuspidata* Harv., from Guayacan, Coquimbo, in Chile. (See Plate 155).

According to a note in the Kew Herbarium by J. Buchanan this striking species flowers in July and August and grows on sandy and stony soil usually under *Cactus* bushes and other shrubs; at the time of its discovery it was very common in the neighborhood of Guayacan, and it has been collected there in fruit by Dr. C. Grandjot as recently as September 1934.

CORRECT SPELLING OF BOÖPHONE

Boöphone Herb. App. 18 (1821). There has been a great difference of opinion as to the correct spelling of this generic name, the incorrect spelling *Buphane* having been used more than any other. Herbert's original spelling was *Boophane*. Since his first species was *Haemanthus toxicarius* Linn. f., Bot. Mag. t. 1217, which is there stated to be fatal to horned cattle, it is clear that Wittstein's derivation from $\beta\omicron\upsilon\varsigma$ = ox and $\phi\omicron\nu\eta$ = murder is correct. The spelling *phane* therefore, is without doubt an unintentional orthographic error and should be corrected to *phone* under Article 70 of the International Rules of Botanical Nomenclature, a correction which Herbert himself made in 1825 (Bot. Mag. post t. 2606) when he spelt the name *Buphone*. There is however no justification under the International Rules for his altering *Boo* to *Bu*, since the former is the uncontracted stem of $\beta\omicron\upsilon\varsigma$. Marloth's derivation (Fl. S. Afr. 4. 115 1915) of the name "Bupho" (i. e. Bufo) = toad is an uninspired guess.

*The Herbarium,
Royal Botanic Gardens,
Kew*

G. Milne-Redhead.

FURTHER REVISION OF THE GENUS *AMARYLLIS* (LINN. EX PARTE) (SYN. *HIPPEASTRUM* HERB.)

HAMILTON P. TRAUB AND J. C. TH. UPHOF

In a previous paper (*Herbertia* 5: 114-131. 1938) descriptions of most of the species of *Amaryllis* proposed since 1888 were included, and a tentative revision of the genus was attempted. The purpose of the present article is to complete the work as far as is possible at this time. The real need for this is shown by the fact that at least three specific names have been used twice within the genus—*angustifolium*, *soratense* and *laetum*. If this genus had received proper attention in the past this could hardly have happened. Many of the species have been carelessly described, and have been proposed without due comparison with those previously published. This may mean that many of the proposed species will most likely have to be reduced to the rank of varieties or synonyms later on when a more thorough study can be made. Such a further revision should be based on the examination of living material as well as on the literature and the existing herbarium specimens.

We wish to take this opportunity of expressing our appreciation to the Librarian and associates of the United States Department of Agriculture, Washington, D. C. for much efficient help in locating references, and to the Bibliofilm Service that has made it possible to secure photo-prints of all the literature required for this research.

After a general discussion of the species remaining to be considered, there follows a key to the subgenera and species, and the descriptions of the eighteen species not previously reprinted in *Herbertia*. All of the species of *Amaryllis* can now be found by referring to volumes 1, 5 and 6 of *Herbertia*.

GENERAL CONSIDERATIONS

In the previous article, the following 14 species were considered, but were not described in detail, and were not classified,—

Species proposed by Dr. Philippi:

<i>A. ananuca</i>	<i>A. Moellerii</i>
<i>A. araucana</i>	<i>A. Philippiana</i>
<i>A. Bakerii</i>	<i>A. popetana</i>
<i>A. coloniana</i>	<i>A. purpurata</i>
<i>A. consobriniana</i>	* <i>A. Solisii</i> (= <i>A. flava</i>)
<i>A. laeta</i>	<i>A. tenuiflora</i>

Species proposed by others:

<i>A. Forgetii</i> (Worsley)	<i>A. splendens</i> (Renjifo)
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Since the last report, the following additional species have come to light,—

**Hippeastrum ambiguum* Herb.
 **Amaryllis Blumenavia* (C.Koch
 et Bouche ex Carr.) Traub
 **Hippeastrum decoratum* Lema-
 ire

**Habranthus fulgens* J. D.
 Hooker
 **Amaryllis Kromerii* Worsley
 **Hippeastrum* (*Rhodophiala*)
laetum Philippi

In the above lists, the species that have been starred (*) have not been fully considered in the previous article, and will be very briefly discussed here together with two newly proposed subgenera.

Dr. Philippi proposed *Habranthus flavus* in 1865, but later, in 1890, he proposed the name, *Hippeastrum Solisii* (= *Amaryllis Solisii*) based on this species, that must now give way to the combination *Amaryllis flava* as indicated later in this paper. *Hippeastrum ambiguum* Herb. was reduced to the rank of a hybrid, *Amaryllis solandriflora* X *Amaryllis vittata*, by Baker in 1888. Recently Claude Hope (Nat'l Hort. Mag. Oct. 1938) has made the suggestion that this may be entitled to specific rank in line with Herbert's description. However, the case has not been conclusively proved. It may be that this is a variety of *Amaryllis solandriflora* with a somewhat shorter tube. Sealy (Curtis's Bot. Mag. 1937) has shown that *Griffinia Blumenavia* belongs in the genus *Amaryllis*, and is identical with *Amaryllis iguapensis*. *Hippeastrum decoratum* Lemaire, and *Habranthus fulgens* J. D. Hooker, both described before 1888, were apparently overlooked by Baker. The former, proposed by Lemaire in 1854, is apparently a variety of *Amaryllis psittacina*. The latter, described in 1866, by J. D. Hooker, is near to *Amaryllis phycelloides* from which it differs particularly in the structure of the corona as well as in other characters. The new combination, *Amaryllis fulgens*, is proposed in place of *Hippeastrum fulgens*. Although the description of *Amaryllis Kromerii*, belonging to the *Amaryllis organensis* group, was made by Arthington Worsley as far back as 1903, it was not published until the present year in this issue of *Herbertia*. Baker, in 1888, suggested that *Rhodophiala laetum* Philippi, described in 1873, was identical with *Amaryllis pratensis*, but the description is lacking in important details. Final disposition of it can not be made until the type specimen can be examined in the Museum of the University of Chile. In 1890, Dr. Philippi made the combination *Hippeastrum* (*Rhodophiala*) *laetum*, but earlier in the same paper he proposed the combination *Hippeastrum* (*Habranthus*) *laetum*. The former is unnamed, and the new name, *Amaryllis atacamensis* is proposed for it.

Traub (*Herbertia* 5: 131.1938) has found it logical to consider *Amaryllis Blumenavia* as the type on which he based the subgenus *Sealyana*, and in this issue of *Herbertia* he has proposed the subgenus *Worsleya* on the basis of the seed structure of *Amaryllis procera*, the type of this monotypic subgenus.

KEY TO THE SUBGENERA AND SPECIES OF THE GENUS AMARYLLIS

The following classification now includes all the subgenera and species of the Genus *Amaryllis*. Although 77 species have been tentatively admitted, it is likely that this number will be reduced considerably later on when the whole group has been studied critically.

Classification of the Subgenera and species of the Genus Amaryllis (Linn. ex parte) (syn. Hippeastrum)

A. Leaves linear to slightly lorate, tube always short;

B. Perianth openly funnel-shaped, stigma trifid. . . . SUBGENUS 1. CHILANTHE
(Traub & Uphof)

C. Umbel 3-10 flowered;

- | | |
|---------------------|-------------------------|
| 1. <i>Jamesonii</i> | 6. <i>pulchra</i> |
| 2. <i>Bertroana</i> | 7. <i>marginata</i> |
| 3. <i>Bagnoldii</i> | 8. <i>ananuca</i> |
| 4. <i>bifida</i> | 9. <i>consobriniana</i> |
| 5. <i>advena</i> | 10. <i>Moellerii</i> |

CC. Umbel 1-2 flowered;

- | | |
|-----------------------|----------------------|
| 11. <i>lineata</i> | 15. <i>andicola</i> |
| 12. <i>rosea</i> | 16. <i>splendens</i> |
| 13. <i>chilensis</i> | 17. <i>flava</i> |
| 14. <i>soratensis</i> | 18. <i>purpurata</i> |

BB. Perianth openly funnel-shaped; stigma capitate; . . . SUBGENUS 2. RHODOPHIALA (Presl)

D. Umbel 2-6 flowered;

- | | |
|----------------------|------------------------|
| 19. <i>montana</i> | 21. <i>atacamensis</i> |
| 20. <i>pratensis</i> | 22. <i>Bakeri</i> |

DD. Umbel 1-2 flowered;

- | | |
|------------------------|----------------------|
| 23. <i>uniflora</i> | 26. <i>araucana</i> |
| 24. <i>rhodolirion</i> | 27. <i>coloniana</i> |
| 25. <i>modesta</i> | 28. <i>Popetana</i> |

BBB. Perianth narrowly funnel-shaped. . . . SUBGENUS 3. PHYCELLA (Lindl.)

E. Stigma trifid to minutely tricuspidate;

- | | |
|-------------------------|------------------------|
| 29. <i>gladioloides</i> | 34. <i>Elwesii</i> |
| 30. <i>granatiflora</i> | 35. <i>tenuiflora</i> |
| 31. <i>bonariensis</i> | 36. <i>Philippiana</i> |
| 32. <i>Gayana</i> | 37. <i>laeta</i> |
| 33. <i>Herbertiana</i> | 38. <i>fulgens</i> |

EE. Stigma capitate;

- | | |
|--------------------|-------------------------|
| 39. <i>bicolor</i> | 40. <i>phycelloides</i> |
|--------------------|-------------------------|

AA. Leaves sickle-shaped, or distinctly lorate, or petiolate; perianth-tube long or short;

F. Corona wanting or obscure; perianth-tube long or short;

G. Perianth-tube long SUBGENUS 4. MACROPODASTRUM (Baker)

- | | |
|--------------------------|----------------------|
| 41. <i>solandriflora</i> | 44. <i>tucumana</i> |
| 42. <i>candida</i> | 45. <i>Haywardii</i> |
| 43. <i>viridiflora</i> | |

G.G. Perianth-tube short;

H. Stigma trifid; seeds compressed, winged, or sub-globose;

I. Seeds compressed, winged, leaves lorate SUBGENUS 5. LAIS (Salisb.)

- | | |
|-----------------------|-------------------------|
| 46. <i>Canteraii</i> | 51. <i>flammigera</i> |
| 47. <i>breviflora</i> | 52. <i>rutila</i> |
| 48. <i>vittata</i> | 53. <i>Damaziana</i> |
| 49. <i>Harrisonii</i> | 54. <i>angustifolia</i> |
| 50. <i>petiolata</i> | |

II. Seeds sub-globose, leaves petiolate SUBGENUS 6. SEALYANA (Traub)

- | | |
|-----------------------|-----------------------|
| 55. <i>Blumenavia</i> | 56. <i>reticulata</i> |
|-----------------------|-----------------------|

HH. Stigma capitate; seeds compressed, D-shaped, not winged, leaves sickle-shaped SUBGENUS 7. WORSLEYA (Traub)

57. *procera*

FF. Corona intermediate in development, usually of scales, but sometimes fimbriate; perianth-tube short SUBGENUS 8. ASCHAMIA (Salisb.)

J. Stigma trifid; perianth-tube very short, above an inch long;

- | | |
|-----------------------|-----------------------|
| 58. <i>belladonna</i> | 60. <i>crociflora</i> |
| 59. <i>reginae</i> | |

JJ. Stigma capitate; perianth-tube 1/2 to 1 inch long;

- | | |
|-----------------------|------------------------|
| 61. <i>stylosa</i> | 65. <i>miniata</i> |
| 62. <i>Leopoldii</i> | 66. <i>Andreana</i> |
| 63. <i>Mandonii</i> | 67. <i>Muesseriana</i> |
| 64. <i>scopulorum</i> | |

FFF. Corona incurved, sometimes closing in the throat, perianth-tube short SUBGENUS 9. OMPHALISSA (Salisb.)

K. Stigma trifid;

- | | |
|-----------------------|-----------------------|
| 68. <i>calyptrata</i> | 71. <i>organensis</i> |
| 69. <i>psittacina</i> | 72. <i>Kromerii</i> |
| 70. <i>platensis</i> | 73. <i>aulica</i> |

KK. Stigma capitate;

- | | |
|---------------------|---------------------|
| 74. <i>Forgetii</i> | 76. <i>fusca</i> |
| 75. <i>pardina</i> | 77. <i>Cybister</i> |

DESCRIPTION OF SPECIES

(Baker in 1888 described 38 species, and these were reprinted in Vol. 1, Herbertia, 1934; one of these species has been transferred elsewhere, leaving 37 species; of the species proposed since 1888, 23 species were reprinted in Herbertia Vol. 5, 1939, but one of these, *A. iguapensis*, proved to be synonomous with *A. blumenavia* which is described below together with 17 additional species.)

8. A. ANANUCA (Phil) Traub & Uphof in Herbertia 5;130.1938; syn. *Hippeastrum* (*Habranthus*) *ananuca* Phil. in Anal. Univ. Chile 1890.

Description.—Bulb almost globose, 4 to 4½ cm. in diam.; leaves not contemporaneous with the flowers, 5 mm. wide; scape 20 to 22 cm. high; spathe 4 cm. long; umbel 2-5 flowered; pedicels relatively long; perigone 67 mm. long, deep lemon yellow, the middle vein of the segments a lively red. Tube 3 mm. long; segments 10 mm. wide; stamens equal to ½ the perigone, declinate with the style and ascending; style longer than stamens, equal to ¾ of the perigone, stigma slender, curved backward, 3 mm. long; fruit and seeds unknown.

Habitat.—Chile; common in the Province of Atacama near Caldera, Carrizal, etc., including Ananuca.

Notes.—Philippi claims that it can be easily distinguished from *Amaryllis Bag-noldii* of the Province of Coquimbo.

9. *A. CONSOBRINIANA* (Phil.) Traub & Uphof in *Herbertia* 5:131.1938; syn. *Hippeastrum* (*Habranthus*) *consobrinum* Phil. in *Anal. Univ. Chile* 1890.

Description.—Bulb and leaves unknown; scape 9 mm. diam.; spathes two, 55 mm. long, pale green with veins somewhat pronounced; bracts linear, membranous; pedicels 35-55 mm. long; umbel 6-flowered; perigone 55 mm. long, bell-shaped, less open than in *Amaryllis fulgens*, the general aspect of the flower is scarlet, and the outside lower one-third is quite green, the color gradually changing to scarlet upwards; in the inside, the segments are pale yellow at the base, with a streak of deep yellow in the center of the scarlet upper portion; corona of scales, very small, near the base of the filaments; stamens and style declinate, then ascending, almost equaling the perigone; filaments and style white at base, red in upper part; stigma trifid, 2 mm. wide, lobes very short; fruit and seeds unknown.

Habitat.—Chile; generally distributed in the Andes in the Province of Santiago.

Notes.—Philippi points out that it has long pedicels like those of *Amaryllis phycelloides*.

10. *A. MOELLERII* (Phil.) Traub & Uphof in *Herbertia* 5:131.1938; syn. *Hippeastrum* (*Habranthus*) *Moelleri* Phil. in *Anal. Univ. Chile* 1890.

Description.—Bulb unknown; leaves contemporaneous with the flowers, 9 mm. wide, almost equalling the scape in length; scape up to 25 to 30 cm. high, 4 to 6 mm. in diam; spathe valves 2, as long as the pedicels which are 33 mm. long; umbel 3-5 flowered; perigone 45 mm. long, funnel-shaped, rose red, white at base; corona of small appendages at the base of the stamens; the longer stamens about two-thirds as long as the perigone, declinate; stigma trifid, lobes slender and recurved.

Habitat.—Chile; was collected in Araucania.

16. *A. SPLENDENS* (Renjifo) Traub & Uphof in *Herbertia* 5:131.1938; syn. *Habranthus splendens* Renjifo in *Anal. Univ. Chile* 1884, t. 65, p. 300; *Hippeastrum* (*Habranthus*) *splendens* (Renjifo) Philippi in *Anal. Univ. Chile* 1890.

Description.—Bulb egg-shaped, scales dark; leaves 7-13 mm. wide, 15 to 90 cm long, or longer, green or grayish green, with two to four veins, flat, striated (with two to four veins); scape 13 mm. in diam. and 30 to 60 cm. or more in length; spathes 2, lanceolate-ovate, marcescent; umbel 1-3 flowered; pedicels unequal, erect, 13 to 55 mm. long; perigone erect or slightly declinate, funnel-shaped, briefly tubulose, tube 3-5 mm. long; corona of oblong orange-yellow appendages, irregularly lacinate at apex, 5-7 mm. long; segments more or less equal, lanceolate, reflexed expanded above; 8 cm. or more long, 15 to 27 mm. wide, with the three sepaline segments rather pointed at the apex, barbate; the petaline segments obtuse; lower half of perigone yellow-green marked with red lines, the upper half brilliant vermilion-orange; stamens unequal, declinate, red, white at base, three rather longer but shorter than style; style declinate, red above, almost as long as the perigone; stigma trifid, obtuse; fruit and seeds unknown.

Habitat.—Chile; Province of Curico.

Notes.—Philippi states that this might be identical with *Amaryllis pratensis*, but he points out that according to the description of the latter in *Gay Bot. VI.* p. 70, the perigone of *Amaryllis splendens* is shorter, and differs at first sight from *Amaryllis pratensis* in having red filaments and style in place of yellow.

17. *AMARYLLIS FLAVA* (Phil.) Traub & Uphof, comb. nov.; syn. *Habranthus flavus* Phil. *Anal. Univ. Chile* XXVII. p. 333. 1865; *Hippeastrum* (*Habranthus*) *solisi* Phil. *Anal. Univ. Chile* 1890; *Amaryllis Solisii* (Phil.) Traub & Uphof, *Herbertia* 5: 131.1938.

Description.—Bulb unknown; leaves serotinous, scarcely 2 mm. wide, flat and obtuse, 5 cm. long; scape 15 to 20 cm. high; spathe valves two, equal, scarious and without color at the base, reddish at the apex, 26 to 35 mm. long, longer than the pedicels; umbel 1-flowered; perigone 48 mm. long, yellow, the tips of the sepaline

segments recurved, somewhat mucronate, 44 mm. long, the petaline segments with 7 veins; stamens 24 to 27 mm. long, style 3 cm. long; stamens and style declinate; fruit and seeds unknown.

Habitat.—Chile; discovered near Chillan by Man. Ant. Solis de Obando.

Notes.—First described by Philippi as *Habranthus flavus* in 1865; later in 1890 he applied the epithet *Solisi* which must give way to the combination *Amaryllis flava*.

18. *A. PURPURATA* (Phil.) Traub & Uphof in *Herbertia* 5: 131.1938; syn. *Hippeastrum* (*Rhodophiala*) *purpuratum* Phil. Anal. Univ. Chile 1890.

Description.—Bulb ovate, 23 mm. in diam., scales blackish; leaves three, contemporaneous with the flowers, 2 mm. wide, and as long as the scape; scape 35 cm. high; spathe valves whitish, 26 mm. long; pedicels 5 mm. long; umbel 1-flowered; perigone 36 mm. long, erect, segments of normal shape, purple; stamens about $\frac{1}{2}$ as long as the perigone; style not much longer, thickened toward the apex; stigma trifid, thick, dark in color.

Habitat.—Chile; grows on eastern slope of Andes in the region known as de Linares, where it was collected in January 1874 by P. Ortega.

21. *AMARYLLIS ATACAMENSIS* (Phil.) Traub & Uphof, comb. nov.; syn. *Rhodophiala laeta* Phil. in *Florula Atacamensis* 1860; *Hippeastrum* (*Rhodophiala*) *laetum* Phil. in Anal. Univ. Chile 1890.

Description.—Bulb and leaves unknown; scape more than a foot high; umbel 3-5 flowered; spathe valves scarious, the exterior tinged purple; longer than the pedicels; perianth tube very short, the perianth segments lanceolate and equal; perigone violet-purple, immaculate; stamens half as long as the perianth segments, and ascending like the style which is much longer.

Habitat.—Chile; a plant of the hills of Atacama; found in a grassy region near Paposo about 1200 ft. above sea level.

Notes.—This species was first described as *Rhodophiala laeta* in 1860; in 1890, Philippi described *Hippeastrum* (*Habranthus*) *laetum* in the *Anales Universidad Chile*, and further on in the same paper, made the combination *Hippeastrum* (*Rhodophiala*) *laetum* based on the species that he first described in 1860. Apparently the latter species is without a name and it has been named for the Province of Atacama.

Baker (1888) suggests that this species may be a variety of *Amaryllis pratensis*.

22. *A. BAKERII* (Phil.) Traub & Uphof in *Herbertia* 5:130.1938; syn. *Habranthus Bakerii* Phil. in Anal. Univ. Chile 1890.

Description.—Bulb 30 mm. in diam., scales membraneous, black; leaves, contemporaneous with the flowers, 3-7 mm. wide, length unknown, but probably as long as the scape; spathe 2-valved, equal to the pedicels, 35 mm. long; umbel 3-5 flowered; perigone funnel-shaped, yellow, as long as the pedicels; stamens not very unequal, two-thirds as long as the perigone or longer; stigmatic lobes short and thickened; fruit and seeds unknown.

Habitat.—Chile; Philippi's son Fredericus found it at the foot of Mt. Descabezado del Maule in the Province of Talca.

Notes.—Philippi states that this species can be distinguished from *Amaryllis advena* var. *pallida* by its funnel-shaped perigone. The leaves of the specimen upon which Philippi based his description were incomplete because the terminals had been eaten by cattle.

26. *A. ARAUCANA* (Phil.) Traub & Uphof in *Herbertia* 5: 130.1938; syn. *Hippeastrum* (*Habranthus*) *araucanum* Phil. in Anal. Univ. Chile 1890.

Description.—Bulb diam. 27 mm.; leaves contemporaneous with the flowers, 4 mm. wide, equalling the scape, which together with the flowers is 30 cm. high, and is comparatively slender, the thickness being scarcely more than 2 mm.; spathe valves 2. 32 mm. long, almost equalling the pedicels; umbel 2-flowered; perigone 37 mm. long, funnel-shaped, erect, rose colored, green at base; the longer stamens are half and the style three-fourths as long as the perigone; structure of stigma not indicated; fruit and seeds unknown.

Habitat.—Chile; collected by Volckmann in the Andes of Araucania l. d. Cupulhue.

Notes.—Philippi states that it differs from *Amaryllis rosea*, native to the Isles of Chiloe, which has a more openly funnel-shaped perianth.

27. *A. COLONIANA* (Phil.) Traub & Uphof in *Herbertia* 5:130.1938; syn. *Hippeastrum* (*Habranthus*) *colonum* Phil. in Anal. Univ. Chile 1890.

Description.—Bulb egg-shaped, 2 cm. in diam.; leaves contemporaneous with the flowers, 3 mm. wide, often equal in length to the scape; scape 30 cm. high; spathe valves 2, grassy green, 2½ cm. long; pedicels equalling the spathes; umbel 1-2 flowered; flowers in November in Chile; perigone funnel-shaped, segments regular, fiery red, base yellow, the yellow part in the interior covering one-fourth to one-third the length of the flower; stamens and style equal to three-fourths of the perigone, declinate, then ascending; filaments yellow; upper part of style red; stigma club-shaped, almost three-lobed; fruit and seeds unknown.

Habitat.—Chile; frequent in Araucania from Renaico to Temuco.

Notes.—Philippi states that the "divisions of the single lobes form beards to the apex."

28. *A. POPETANA* (Phil.) Traub & Uphof in *Herbertia* 5:131.1938; syn. *Hippeastrum* (*Rhodophiala*) *Popetanum* in Anal. Univ. Chile 1890.

Description.—Bulb unknown; leaves unknown, not present during flowering time (January in Chile); scape 20 cm. high; spathe valves two, reddish, herbaceous, reaching to half the perigone length; pedicel 8 mm. long; umbel 1-flowered; perigone 7 cm. long, tube green, one-third as long as the perigone; segments of a beautiful pink and reflexed; stamens about ½, the style almost ¾ as long as the perigone; stigmatic lobes undivided.

Habitat.—Chile; grows in the Andes in the so-called Cordillera De Popeta in the Province of O'Higgins.

35. *A. TENUIFLORA* (Phil.) Traub & Uphof in *Herbertia* 5: 131.1938; syn. *Hippeastrum* (*Habranthus*) *tenuiflorum* Phil. in Anal. Univ. Chile 1890.

Description.—Bulb and leaves unknown; scape about 20 cm. high; spathe valves two, grassy green, 6 mm. longer than the pedicels which reach a length of 3 to 5 cm. with maturity of fruits; umbel 5-6 flowered; the perigone is divided almost to its base, but has the appearance of a lengthened narrow tube, 48 mm. long and 6 mm. wide at the mouth; the regular, linear-lanceolate segments, 4 mm. wide, extend beyond this by 14 mm. and are slightly bent backward; stamens very unequal, the longer ones and the declinate style being shorter than the perigone; stigma trifid, lobes recurved; capsule is almost globose, 11 mm. in diam.; seeds unknown.

Habitat.—Chile; collected by Frederico Philippi in the Province of Santiago.

Notes.—Philippi states that this species is easily recognized on account of the narrow tubular form of the perigone.

36. *A. PHILLIPPIANA* Traub & Uphof in *Herbertia* 5:130.1938; syn. *Hippeastrum* (*Phycella*) *angustifolium* Phil. non Pax in Anal. Univ. Chile 1890.

Description.—Bulb small, 21 mm. in diam.; leaves two, as long as the scape, narrow, 3 mm. wide; scape 312 mm. high; spathe valves 21½ to 23½ mm. long, obtuse and of irregular length, and sometimes as long as the pedicels and perigone combined; inside the spathe valves there are a number of narrow bracts, almost as long as the spathe valves; umbel 2-3 flowered; pedicels erect, shorter than the spathe valves; perigone scarlet, 34 mm. long, tubular, funnel-shaped, the diameter at the mouth being hardly 8 mm.; stamens much longer than the perigone, the style either much longer or much shorter than the stamens, and this variation may be found in one umbel; corona not detected. (Philippi is silent about the structure of the stigma.)

Habitat.—Chile; in the valley of Maipo near the mine Cristo; specimens were obtained by Mr. Benjamin Davila for the Museum (Santiago, Chile).

Notes.—Philippi, who examined 5 specimens, observes, "Our species differs from *Phycella Herbertiana* Lindl. which has narrow leaves of unequal length, but which have not been sufficiently observed."

37. *A. LAETA* (Phil.) Traub & Uphof in *Herbertia* 5:131.1938; syn. *Hippeastrum* (*Habranthus*) *laetum* Phil. in *Anal. Univ. Chile* 1890.

Description.—Bulb unknown; leaves unknown, except in a mutilated condition, 5 mm. long; scape 40 cm. long; umbel many-flowered; spathe of many bracts; pedicels 5 cm. long, and almost as long as the perigone which is scarlet in color, and funnel-shaped; the scales are minute and originate from the filaments; the shorter stamens half as long, the longer two-thirds as long, as the perigone; style not much longer than the longer stamens and shorter than the perigone; stigma trifid, lobes elongated and much reflexed.

Habitat.—Chile; collected near Tiltill, in the Province of Santiago, October 1879.

Notes.—According to Philippi this species differs from *Amaryllis phycelloides* and *Amaryllis fulgens* by its larger stigmatic lobes.

38. *AMARYLLIS FULGENS* (J. D. Hooker) Traub & Uphof, comb. nov.; syn. *Habranthus fulgens* J. D. Hooker in *Curtis's Bot. Mag.* 1866, t. 5563; A. Verschaffelt t. (?); *Hippeastrum* (*Habranthus*) *fulgens* (J. D. Hooker) Phil. in *Anal. Univ. Chile* 1890.

Description.—Bulb unknown; leaves glaucescent, 10-12 inches long, half to three-quarters of an inch broad, linear, recurved, obtuse, convex, and scarcely keeled at the beak; scape one to one and a half foot high, as thick as the little finger, glaucous green above, purple below; flowers seven in this specimen, four to five inches across, bright scarlet; tube yellow externally; lobes linear-oblong, acute, golden-yellow at the base, the yellow forming a defined triangular mark; scales at the base of the tube of corolla, six, forked; stamens with yellow filaments; stigma minutely three lobed; fruit and seeds unknown.

Habitat.—Chile; collected by Philippi in the Province of Santiago.

Notes.—Hooker's description was based on a plant sent him by Messrs. Backhouse, of York, with whom it flowered in April 1865. Philippi had only the plate by Verschaffelt, whom he compliments as representing the plant well. He points out that the yellow which forms the star in the interior of the perigone is too marked, and the spathe valves, the style and filaments are yellow that are first reddish, then clearly red in the plants in their mountain habitat. The leaves are 9 mm. wide, but the Verschaffelt plate shows them as 15 mm. wide, which Philippi claims may be due to the influence of culture in fertilized soil. Philippi states in his notes that the umbel is 2-7 flowered; perianth segments scarlet; corona of elongated bifid scales, 11 mm. long at the base of the stamens; stigma obscurely 3-lobed, practically undivided.

55. *A. BLUMENAVIA* (C. Koch et Bouche ex Carr.) Traub in *Herbertia* 5:131. 1938 syn. *Griffinia Blumenavia* C. Koch et Bouche ex Carr. in *Rev. Hort.* 1867, p. 32, c. tab; Hook f. in *Bot. Mag.* t. 5666 (1867); *Gard. Chron.* 1871, p. 711; c. fig.; *Gartenflora* XXI. 52, c. fig. (1872); *The Garden*, XIX. 528, c. fig. (1872); *Nicholson's Ill. Dict. Gard.* II. 99. c. fig. (1885); *Neubert's Deutsch. Gart. Mag.* 1885, p. 12, c. fig.; W. W. (Watson) in *The Garden*, L. 208, c. tab. (1896); *Bellair & St.-Leger. Pl. Serre*, 873, c. fig. (1900); *Hippeastrum iguapense* R. Wagner in *Wien. Ill. Gart. Zeit.* XXVIII. 281, t. 3 (1903); *Hippeastrum Blumenavia* (C. Koch et Bouche ex Carr.) Sealy in *Curtis's Bot. Mag.* tab. 9504.1937; *Amaryllis iguapensis* (R. Wagner) Traub & Uphof in *Herbertia* 5:125-126.1938.

Description.—Bulb globose, about 4 cm. in diam.; bearing one or two leaves with the flowering stem, and later on up to 7 leaves; leaves petioled, blade narrow, oblong-obovate or broad oblong-oval, acute, cuneate at the base, 8-12 cm. long, 2-5.7 cm. wide; petiole 4-6 cm. long and about 5 mm. broad; scape up to about 20 cm. long; spathe-valves 2, more or less erect, narrow oblong-lanceolate and long acuminate, 5.5 cm. long, 1.1 cm. wide; flowers 4-5, patent, horizontal at first but soon somewhat cernuous; bracts 1-4.5 cm. long; pedicels 2.2-3 cm. long; perigone funnel-shaped, segments spreading and slightly recurved at the apex, 6.5 to 7.5 cm. across, white with mauve-crimson lines and bands running downwards into the tube; segments united for about 5 mm. at base; sub-equal in length, but unequal in width, 5.5 cm. to 6 cm. long, 1 cm. to 2.1 cm. wide; stamens declinate, filaments united to perigone for about 5 mm. at base, 3.4 cm to 4.8 cm. long; corona a finely lacinate

white membrane about 2 mm. long inserted between the perigone and the base of the filaments; style white, about 5 cm. long; stigma 3-fid, lobes about 2 mm. long; ovary 5 mm. long, 4 mm. in diam.; ovules about 12 in each loculus in superposed pairs; capsule globose, about 1 cm. in diam. crowned by the persistent, shrivelled perigone; seeds one or two developed in each loculus, rounded on back with flat surfaces, 6-7 mm. long and about 5 mm. broad, shining, translucent, the testa olive-brown at first but eventually black and produced at the top of the seed as a large flattish wrinkled crest which resembles a "walnut" cock's comb.

Habitat.—Southeast Brazil.

Notes.—The above description is abridged from the excellent detailed description of this species by Mr. J. R. Sealy which appeared in Curtis's Botanical Magazine in 1937.

69. *AMARYLLIS PSITTACINA* Gawl var. *decorata* (Lemaire) Traub & Uphof, comb. nov.; syn. *Hippeastrum decoratum* Lemaire in Jardin Fleur vol. 4, t. 338. 1854; Nat'l. Hort. Mag. 18:66-67.1939.

Notes.—We can find no specific difference between *Amaryllis psittacina* Gawl. and *Hippeastrum decoratum* Lemaire.

72. *A. KROMERII* WORSLEY in Herbertia 6:117-118.1939.

(For complete description of this new species see pages 117-118 of this issue of Herbertia).

74. *A. FORGETII* (Worsley) Traub & Uphof in Herbertia 5:131.1938; syn. *Hippeastrum Forgetii* Worsley in Gard. Chron. 1912, p. 108; Jour. Roy. Hort. Soc. July 1912, p. 73-75.

Type material.—None available; description was made from living plants by Arthington Worsley at Isleworth, England, in 1912.

Description.—Bulb rather small, neck 3 in. long; leaves 6, contemporaneous with the flowers, lanceolate-tipped, dull light green, ruddy on back, ultimately 2 ft. long by 1½ in max. width; scape 2-flowered, slender, about 2 ft. high; pedicels 3 in. long, equalling the spathe-valves; flowers stellate, dull crimson, distinctly keeled in the lower half with a green keel, base green, span 6 in. by 5½ in. horizontally; limb 4½ in. long, scentless, the 3 outer segments slightly incurved, 4 in. long by 1 in. max. width, the inner slightly narrower, the lowest 3½ in. long by ¾ in. max. width; tube under ¼ in. long, completely closed in by the incurved corona, the throat bearded by tufts of white hairs three-eighths in. long borne on the green corona; stamens contiguous, very little if at all exerted, pollen yellow, style exerted ½ in. beyond the lowest segment; stigma 3-lobed; fruit sub-triquetous, ovules normally seated, about 75 in all (25 in each row).

Habitat.—Peru; near Cuzco.

Notes.—Described by Mr. Worsley from bulbs gathered by Mr. Forget near Cuzco, Sept. 23, 1909, and imported into England. Mr. Worsley states that it differs in a few particulars from *Amaryllis pardina*, notably in the unspotted, sub-vittate coloration of the flowers and the narrower segments. In the same importation were found two variations ("A" and "B") that were similar to *Amaryllis Forgetii*, and also *Amaryllis pardina* var. *tricolor*, and a variation ("C") near to the latter. Variety "A": flower of an intense dark red, with narrower segments, and a very short star; Variety "B": irregularly blotched with white at the apices of all segments; Variety "C": inflorescence substantially like *Amaryllis pardina*, but unspotted.

REGISTRATION OF NEW VARIETIES

Descriptions of new varieties of hybrid amaryllids and alstroemerids for this section should reach the editor by June 1 if possible. Information sent after that date may be held over to the next issue if space is not available. This information is published to avoid duplication of names, and to provide a place for the authentic recording of brief descriptions. Names should be as short as possible—*one word is sufficient*. It is suggested that in no case should more than two words be used.

HYBRID AMARYLLIS VARIETIES

Introduced by Frank Vasku, Winter Park, Fla.

CHARMAINE (No. 90) A brilliant red with a cream colored throat 6 inches across. It probably belongs in group 219 of the Year-book classification table.

ERNEST PYE (No. 166) A compact red flower suffused with white toward the center, about 8-inch size, group 221.

JOHN VASKU (No. 401) An 8-inch light compact red with white throat and keels. Group 219.

DARK RED BONNET (No. 206) A dark red flower of solid color 7 inches across. Group 223.

PRESIDENT BENES (No. 606) A 7-inch flower of rich warm stoplight shade of red. Group 220.

SONIA (No. 619) Group 205, 7 inches across with white keels, red veins and edges suffused with red.

JEAN SWOPE (No. 625) Group 215, a cerise red with a touch of yellow inside, 7-8 inch size.

DEETTA PYE (No. 616) An 8-inch flower of solid dark red with stamens yellow at the base. About same color as Dark Red Bonnet but larger and somewhat different shape. Also group 223.

HYBRID DAYLILY (HEMEROCALLIS) VARIETIES

Introduced by Lakemont Gardens, Wyndham Hayward, Winter Park, Fla.

LENORE (HC-131); Seedling of *H. fulva* var. *rosea*, evergreen, with darkish coppery red flowers, rather full and compact type of bloom, even brownish rose coloring of petals, golden throat, slightly darker mid-zone marking, free flowering, 6 in. blooms, faint yellowish edging of sepals; 3 to 4 ft.

E. W. YANDRE (HD-12); Vigorous, large wide-petaled flowers, flaring open very widely, gold throat and base with fulvous bronze shading and darker eye-zone; gold bordered and striped; edges crepy; bold type of bloom, showy and full; six-in flower, plant 2-3 ft.; evergreen.

EMPEROR JONES (HD-9); deep mahogany red to purple black flowers with lighter golden stripe in mid-petal; free blooming, vigorous, clear golden throat; stands sun well; 6-in flower, plant 3-4 ft.; full, slightly recurved petals, flowers having a purple-black sheen when seen in morning light; evergreen. (See Plate 159.)

RAMONA (HC-216); Bright brick-red flower on light yellow-gold base; deciduous; seedling of *Lemona* X *H. fulva* var. *rosea*; neat and colorful; trimly shaped flower; pleasingly and symmetrically recurved petals and sepals; gives charming effect; 2 feet.

MINNIE (HC-111); A tiny flowered dark mahogany red type, the color of the petals blending with a real deep crimson tone; lighter orange center; wavy or fluted petals, darker midzone; many flowered and free flowering; semi-evergreen; flowers 3 in.; plant 2-3 ft. An interesting variety with high decorative value.

Introduced by Hamilton P. Traub, Mira Flores, Orlando, Fla.

ST. JOAN (No. 406); robust, petals Moroccan Red, 5-K-11, edges ruffled and lighted up with a golden halo; sepals similar in color but lighter, not ruffled; only a faint eye-zone; first blooms in early April; recurrent bloomer.

REBA COOPER (No. 427); semi-robust; flower color, Sunrise, 10-C-7, eye-zone Raspberry Red, 3-K-9; early April; recurrent.

ESTELLE FRIEND (No. 350); semi-robust, ideal plant and flowering habit, averages 15 flowers per scape; color, Burmese Gold, 3-C-11; faint reddish eye-zone; golden throat; flowers full; early April; recurrent bloomer.

CECIL HOUDYSHEL (No. 420); semi-dwarf, color Doge Red, 4-K-9, eye-zone scarcely perceptible, sepals of similar color but slightly lighter at edges; middle April; named in honor of Herbert Medalist, Cecil Houdyshel.

AUDREY BLASER (No. 423); robust, flowers large and segments recurved; color Sunkiss (orange), 9-K-9, suffused Rufous, eye-zone not prominent; middle April; recurrent bloomer.

MAYOR STARZYNSKI (No. 430); semi-robust; full flower, delightful shade of bronzy-rose; middle April; recurrent bloomer. Named in honor of the heroic defender of Warsaw.

LA TULIPE (No. 436); semi-robust, flowers few and held practically erect, reminiscent somewhat of a Cottage tulip; flower color, large sulfur yellow throat, upper part of petals near dark Cardinal. 6-L-8, sepals somewhat lighter; eye-zone scarcely perceptible; middle April; recurrent bloomer.

JOHN BLASER (No. 439); semi-robust, flowers numerous, near clear Apricot, 9-K-5, petals about $\frac{3}{4}$ inch, and sepals about $\frac{1}{2}$ inch wide; early April. Named in honor of Mr. John Blaser of Sarasota, Fla., who first recognized its value as a cut flower.

FRED HOWARD (No. 440); semi-robust; flowers full with wide segments; petals near Ember, 5-K-10, sepals lighter; eye-zone scarcely perceptible; Chrome-lemon, 9-K-2, throat; late April; recurrent. Named in honor of Herbert Medalist, Fred H. Howard.

CORINNE ROBINSON (No. 462); semi-dwarf, very light pink, near to Etruscan, 4-G-11, early May.

PEONY RED (No. 464); semi-robust; similar to *Fulva Rosea* in growth habit, but flowers are Peony Red, 6-J-6, eye-zone darker; early May.

MILDRED ORPET (No. 468); semi-robust, a very delicately tinted bi-color; throat Sunflower, 9-L-4, petals gradually shading to a clear Peach Blush, 5-C-11; sepals suffused Peach Blush at upper end; early May.

CARNIVAL (No. 476); semi-robust; striking color combination; throat Aureolin Yellow, 10-L-2, tapering to one-eighth inch stripe through center of petals; relatively small portion of petals is Moro Red, 7-L-10; sepals somewhat lighter; middle of May.

RUSSELL WOLFE (No. 477); robust; petals near to Spanish Wine. 7-J-6; sepals slightly lighter golden yellow throat; full flower like Soudan; middle of May.

NEWLY NAMED DAYLILIES

A. B. STOUT

This list is for the daylilies of which the writer has record that have been introduced between May 18, 1937¹ and April 1, 1939. The persons and firms involved in the origin and first distribution of these clones are arranged alphabetically and numbered and the appropriate numbers are given with the names of the clones. Only a few of these clones have been described in horticultural literature and for such cases the reference is given. Certain clones have, however, been described in catalogs of some of the firms mentioned. But a considerable number of the nursery firms which are offering daylilies have recently organized for business and are issuing only typed or mimeographed lists. Hence many of the daylilies here listed have not been described.

LIST OF PERSONS AND FIRMS

- (1) Betscher, C., Dover, Ohio.
- (2) Bristol Nurseries Inc., Bristol, Conn.
- (3) Craemore Garden, Merrimac, Mass.
- (4) Donahue, T. F., Newton Lower Falls, Mass.
- (5) Dreer, Henry H., Inc., Riverton, N. J.
- (6) Dunean Gardens, 32 Smythe Ave., Greenville, S. Carolina.
- (7) Fairmount Gardens, Lowell, Mass.
- (8) Farr Nursery Co., Weiser Park, Pa.
- (9) Fisher, Wm. E., Seneca Falls, New York.
- (10) Floravista Gardens, Olympia, Wash.
- (11) Florida Agri. Exp. Sta., College of Agr., University of Florida. Gainesville, Florida.
- (12) Hillside Gardens, Amesbury, Mass.
- (13) Kelsey-Highlands Nursery, East Boxford, Mass.
- (14) Lakemont Gardens, Wyndham Hayward, Winter Park, Florida.
- (15) Lord, R. P. & E. L., P. O. Box 1948, Orlando, Florida.
- (16) Mass. State College Agri. Exp. Sta., Field Station, Cedar Hill, Waltham, Mass.
- (17) Midwest Gardens, Elkhorn, Nebraska.
- (18) National Iris Gardens, Beaverton, Oregon.

¹A list of New Clones of Daylilies, by A. B. Stout, *Herbertia*, 4: 144-160. 1937.

- (19) Parker Nursery Co., Newark, New York.
- (20) Perry's Hardy Plant Farm, Enfield, Middlesex, England.
- (21) Port Rose Garden, 713 Young's Lane, Freeport, Ill.
- (22) Quality Gardens, Freeport, Ill.
- (23) Roadside Gardens, East Arlington, Vermont.
- (24) Royal Hort. Society, Wisley, England.
- (25) Russell, H. M., Route 6, Houston, Texas.
- (26) Stout, A. B., New York Botanical Garden, New York City.
- (27) Traub, H. P., Mira Flores, Orlando, Florida.
- (28) Wallace, R., & Co. Ltd., The Old Gardens, Tunbridge Wells, England.
- (29) Yeld, George (deceased).

It must be noted that many of the names and also the listing of them do not conform to the simplest common-sense rules or principles which horticultural organizations and conferences have frequently recognized and formulated.² Some of these which apply particularly in this connection may be mentioned.

1. "*A plant can bear but one valid name.*" In several cases a single clone of daylily has been given two or more names or synonyms. At least two nurserymen have the habit of distributing divisions of a plant under a name but later deliberately listing the same clone under a different name. There are also cases in which a clone that has been fairly well known is given a new name.

2. "*The valid name is the earliest which conforms to the accepted rules of nomenclature.*" In several cases two different clones are being sold under one name (a homonym) and in this there may also be the confusion of two differently named clones. For example, in 1929 the Bay State Nurseries introduced two rather distinctly different daylilies under the names *Gypsy* and *Cressida*. Later, plants of the clone *Cressida* have been sold as *Gypsy*. It is obvious that in this case the application of the names in the distributions of 1929 should be considered valid. The designation of the name *Sunbeam* to two different plants, as noted in the above list, is another case of a homonym.

3. The various horticultural daylilies are propagated as *clones* and most of them are complex hybrids. The clonal name should never be a Latin name. It is a "fancy" name that is capitalized; it has the rank of a proper noun for it is the name of an individual plant. It has been decided that, as far as possible, a single word should be used; that prefixes as "Mrs.," "Miss," and "Dr." should be avoided, and that the articles "a" and "the" should not be considered a part of the name. "In order to be valid, a name must be published." The name and a "recognizable description" should appear "in a recognized horticultural or botanical periodical, or in a monograph or other scientific publication, or in a dated horticultural catalogue."

A considerable number of the names listed above do not conform to the recommendations and rules noted above, but are reported here in the effort to make the record as complete as is possible.

²The Naming of Plants, in Journal Royal Horticultural Society. 63:40-41.

THE LIST OF CLONAL VARIETIES

- ALGERIA; 14; *Herbertia*; 1938:
 AMARILLO; 14:
 ANTARES; 14; *Herb.* 1938:
 AUGUST PIONEER; 8; 26; *Jour. N. Y. Bot. Gard.* Feb. 1939:
 AURANTHE; mentioned in *The Gardeners' Chronicle*. Sept. 1, 1934
 AURILLO; 14:
 AZTEC GOLD; 7; 12:
 BALSARA; mentioned in *The Gardeners' Chronicle*, July 24, 1937.
 BARBARA LORD; 15; *Herb.* 1938:
 BELOIT; 16; 18:
 BOBETTE; 23:
 BOUTONNIERE; 8:26; *Horticulture*; Oct. 1, 1938:
 CANARY BIRD; Evidently a misnomer:
 CARMEN; 14; *Herb.* 1938:
 CERES; 28:
 CHARLOTTE TRAUB; 27; *Herb.* 1938:
 CHIPSEA=CHISCA; *Herb.* 1937:
 CHLOE; 7:
 CHRYSANTHA; 12:
 CIMARRON; 15; *Herb.* 1938:
 CLEO; 14; *Herb.* 1938:
 COLUMBINE; 15; *Herb.* 1938:
 COPPER LUSTRE; 15; *Herb.* 1938:
 CORALIE; 15; *Herb.* 1938:
 CRAEMORE RUBY; 3:
 CREPE; 6:
 CRINKLES; 14:
 CROWN PRINCE; 14:
 CRYSTAL PINK; 7:
 CYPREA; 24; Possibly *H. fulva* clone *Cypriana*:
 DAWN PLAY; 7:
 DELOVELY; 14:
 DOMESTICO; 11:
 DOROTHY MCDADE; 17:
 DR. HUGHES; 27; *Herb.* 1938:
 DR. STOUT; 27; *Herb.* 1938:
 DUSTY STARS; 25:
 DUTCHESS OF WINDSOR; 14; [See also Plate 159, this issue of
Herbertia, (1939)].
 EARLIEST; 13:
 ELAINE; 27; *Herb.* 1938:
 ENCHANTRESS; 2:
 FESTIVAL; 8; 26; *Jour. N. Y. Bot. Garden* Feb. 1939:
 FISHER VARIEGATED; 9; 19;
 FLAMANTE; 14:
 FLAMULA; 23:
 FLORIBUNDA; 23:

- FLORIDA; 14: Herb. 1938; [See also Plate 159, this issue of *Herbertia*, (1939)]
- FRANK RUSSELL; 25:
- FULVALA; 1:
- FULVOLA; 1:
- GINGER; 14:
- GITANA; 15: Herb. 1938:
- GLORIOSA; 27; Herb. 1938:
- GLOW; 28:
- GOBLIN; Evidently this is *Goldeni*.
- GOLDEN BYNG OF VIMY; 20; 22; 3:
- GOLDEN DAWN; 7:
- GOLDEN FLEECE; 7:
- GOLDEN GLOW; 27; Herb. 1938:
- GOLDEN MAMMY; 4:
- GOLDEN MANTLE; 11:
- GOLDEN SHADOWS; 25:
- GRANADA; 27; Herb. 1938:
- HANKOW; 8; 26; Jour. N. Y. Bot. Garden, Feb. 1939:
- HAPPINESS; 27; Herb. 1938:
- HARLEQUIN; 15; Herb. 1938:
- HARVEY RUSSELL; 25:
- HEATHER ROSE; 7:
- HECTOR; 15; Herb. 1938:
- HERMES; *syn.* MRS. HELEN CAMPBELL, which was listed in Herb. 1937:
- HESPERUS; 17:
- HOWARD RUSSELL; 25:
- INDIAN CHIEF; 27: Herb. 1938; [See also Plate 159, this issue of *HERBERTIA*, (1939)].
- JAPANESE FALL; 21:
- JAPANESE SPRING; 21:
- JAPANESE SUMMER; 22:
- JENNIE LEE; 25:
- KUBLAI KHAN; 15; Herb. 1938:
- KWANSO VIRGINICA and VIRGINICA; Evidently the old semi-double clone of *H. fulva*.
- LAMAR RUSSELL; 25:
- LEMONE; 5:
- LENA HUGHES; 27: Herb. 1938:
- LILA WHITE; 11:
- LOUISE; 14:
- MALCOLM RUSSELL; 25:
- MAUVE ROSE; 27; Herb. 1938:
- MEDUSA; 23:
- MISS ANNIS; 25:
- MISSIANNI RUSSELL; 25:
- MOONGLOW; 15: Herb. 1938:
- MRS. C. L. SEITH; 1:

MRS. GARLOCK; 19 :
MRS. HERBERT H. DEWEY; 14; Herb. 1938 :
MULTIFLORA HYBRID; 25; Possibly this is one of the Summer Multi-
flora Hybrids :
MULTIFLORA PERRY; 20 :
MYSTERY STAR; 16 :
NEBRASKA; 17 :
NUBIANA; 14; Herb. 1938 :
OLD ROSE; 23 :
OLIVE; 21 :
OMPHALE; 3 :
ORANGE QUEEN; 28 :
ORB; 24 :
OTHELLO; 14 :
PASTEL ROSE; 3 :
PERSIAN PRINCESS; 7 :
PINK LASS; 7 :
RALPH WHEELER; 14 :
RAMONA; 23 :
RED MAN; 23 :
R. I. LEMON; listed in 1939 by Kenwood Iris Gardens.
RITA; 29 :
ROMANY; 15; Herb. 1938 :
ROSALIND; 8; 26; Horticulture, May 15, 1938.
ROSITA; 23 :
RUSSELL, C-28; 25 :
RUSSELL, J. T.; 25 :
RUSSELL, U-29; 25 :
SAMOSET; 7 :
SAN JUAN; 27; Herb. 1938.
SASS NO. 10-33; 17 :
SENATOR ANDREWS; 14 :
SEQUOIA; 25 :
SERENA (Forrestii); 20 : Mr. Perry reports he has discarded this.
SPARTAN; 25 :
SPECIOSA; 28 :
STELLA ROSE; 15; Herb. 1938.
STORM CLOUD; 25 :
SUNBEAM; 15; Herb. 1938—But this name already in use, see page 159
of Herb. 1937 :
SUNRISE; 7 :
SUNSHINE; 6 :
SWEETBRIAR; 7 :
THE MILLER'S DAUGHTER; 25 :
TURY; 15; Herb. 1938 :
VESUVIUS; 15; Herb. 1938 :
VICTOR LORD; 15; Herb. 1938 :
VICTORY TAIERHCHWANG; 27; Herb. 1938 :
WEKIWA; 27; Herb. 1938 :

AN AMARYLLID HERBARIUM

L. H. BAILEY, *Ithaca, N. Y.*

Somewhere in the United States should be a standard herbarium collection of the cultivated Amaryllidaceae correctly determined, to serve as a record and as a basis of comparison and identification. Correspondence has developed the suggestion that the Bailey Hortorium of Cornell University might cooperate in such an enterprise. The Hortorium will be glad to be of service, in connection with its general study of cultivated plants. Such a collection is greatly needed for continued scientific study and for consultation alike by investigators and growers. Many questions could be answered from such a museum as time goes on.

The larger showy amaryllids are very difficult to preserve for herbarium use, and a new technique will need to be developed. The entire plant should be kept in one way or another. A representative plant should be photographed when in bloom, probably from more than one side or view, and the prints with negatives should be housed with the specimens. Whether the entire head or umbel should be pressed will depend on circumstances, but of course individual flowers may be prepared in such way as to show the botanical characters of all the parts, with useful notes on color. Leaves must be pressed. Seed-pods should be kept.

The plant should then be grown to maturity and the entire bulb be preserved and kept in as near its original condition as is possible with a dead and permanent object.

The pressed specimens may be mounted on the most durable heavy herbarium paper. The other material may be stored in boxes that fit into the herbarium pigeon-holes. We use these boxes extensively for cones, nuts, heavy palm materials and similar objects. They are manufactured for us to order. Therefore all the records of any species of plant may be kept together for easy reference.

The preparation of all such material for preservation requires much experience, time and perseverance. But the particular problem is to obtain fresh material for the work, and this requires cooperation of the growers. Mr. Hayward, secretary of the American Amaryllis Society, suggests that collectors and growers of amaryllids send a bulb of each species to me and that we grow the plants here under glass for the purpose of procuring preserved material. We shall be glad to cooperate in such an undertaking as far as possible, but we are not practiced amaryllis growers and we might fail with some of the difficult ones. Now and then a good head, just coming into bloom, might be sent us by mail as cut-flowers are shipped, and the specimens can be prepared here.

Mere horticultural varieties and color sports of standard species need not be added to an herbarium collection unless the differences are such as would show in the prepared specimens.

What is needed is a source herbarium of amaryllid material. The assembling of such a collection could not proceed rapidly, but a beginning could be made without great trouble. Considerable storage space would be required, which we would provide. The collection should be brought together where other cultivated groups are kept and studied, and where library facilities are available.

CRITICAL REVIEW OF SEALY'S "AMARYLLIS AND HIPPEASTRUM"

J. C. TH. UPHOF, *Florida*

In the Kew Bulletin of Misc. Information No. 2, 1939, there appears an interesting article by J. R. Sealy¹ on the nomenclature of *Amaryllis* and *Hippeastrum* that is worth reading—not that it alters in any way the case that is discussed—for it is of interest as an example of a certain type of argumentation. Although Linnaeus in the first edition of *Species Plantarum*, 1753, a work that is universally recognized as the beginning of nomenclature of vascular plants, indicated clearly what he considered typical illustrations² of *Amaryllis belladonna*, it is attempted in Sealy's article of 19 long pages to make out after enveloping the subject in a web of circumstantial evidence not only that Linnaeus was a slip-shod worker but also that it remained for some one 185 years later to show the world what Linnaeus actually meant to illustrate.

In reading the article it is illuminating to analyze the type of argumentation employed. The reader will remember that a year or so back an attempt was made to erase one of the amaryllids, *Habranthus texanus*, native to the State of Texas on the alleged ground that the Texas amaryllid was similar to the Argentinian type and is the only *Habranthus* reported north of the Equator, and that Spanish missions were built in Texas prior to its discovery in that State.³ That there are obvious flaws in the argument is indicated by the facts that the missionaries were not from the Argentine but came out of Mexico, and the amaryllid concerned covers an enormous area in the great State of Texas.⁴ It is clear that all such arguments based on untenable suppositions, although *interesting* do not settle anything! This case is mentioned because it is a similar type of argumentation with which we are again confronted in the article that is the subject of this review.

In the British Museum there is a specimen in the Clifford herbarium that bears no name or identification, and Sealy confesses (p. 51) that "there is no ground for stating either that it is the basis of *Amaryllis belladonna*, or that it is the plant Linnaeus knew in the Clifford garden for the specimen may have been added to the herbarium after Linnaeus had left Holland." On page 58, this becomes merely "There is a specimen of the Cape Belladonna in the Clifford herbarium, but no specimen of *Hippeastrum equestre*." Finally, after he has woven his web of circumstantial evidence, on page 60, one is flabbergasted to read "the specimen may actually be the type, but unfortunately this cannot be proved. However, in the absence of evidence to the contrary this specimen may be accepted as the working type." We are sorry to interrupt this fanciful exercise but we must point out that it is generally recognized that "no argument can ever be drawn from silence." Alas, in this case history is silent!

¹Sealy, J. R. *Amaryllis and Hippeastrum*. Bul. Misc. Inf. Kew. No. 2, 49-68. 1939.

²Uphof, J. C. Th. The History of Nomenclature of *Amaryllis* Linn. and *Hippeastrum* Herb. *Herbertia*. 5:101-109. 1938.

³Sealy, J. R. *Zephyranthes, Pyrolirion, Habranthus and Hippeastrum*. Jour. Roy. Hort. Soc. 62:195-209. 1937.

⁴Flory, Walter S. Cytotaxonomic Notes on the Genus *Habranthus*. *Herbertia*. 5:151-153. 1938.

Since the point he wants to make cannot be proved as he confesses, why not omit it altogether out of due respect for science?

The reader should note the shocking transition from downright condemnation of the evidence to final bald acceptance. It should also be borne in mind that the "blank" specimen is one of the pillars on which his dubious structure is built.

In the article under review, he presents the above jewel, and also a number of other arguments that will be considered later. He summarizes with the statement, "Taken as a whole, the evidence indicates that Linnaeus knew the Cape Belladonna, that he almost certainly based his *Amaryllis belladonna* upon it but confused with it the literature relating to *Hippeastrum equestre*." The reader should note the tell-tale word "almost." There apparently was a reasonable doubt in his mind for "almost certainly" means "very nearly," "all but," unless he used it in the sense of "approximately" which is a weasel word. In order to supercede Linnaeus something more substantial is needed than this.

He next sets down what he considers as four views concerning *Amaryllis belladonna* on the basis of the main points he has brought up, and the web of circumstantial evidence in general, and then he makes his choice. The main pillars of his structure are the suppositions that—(a) the Cape Belladonna was a well known garden plant and *Hippeastrum equestre* was rare, (b) Linnaeus refers to the Cape amaryllid as outstandingly beautiful, an attribute that is scarcely applicable to the American amaryllid, (c) Linnaeus' diagnosis fits the Cape amaryllid better, (d) there is a specimen of the Cape amaryllid in the Clifford herbarium, and (e) in the second edition of *Species Plantarum* Linnaeus made additions that indicated what he meant.

As a result of all this he comes to the conclusion that *Amaryllis belladonna* must be retained for the South African amaryllid, and the rest of the long paper is an attempt to typify the generic name *Amaryllis* L., and to find a valid name for *Hippeastrum*, which even to his view is an *invalid* name that must yield to *Leopoldia*, but never-the-less, he ends up by proposing that the name *Hippeastrum* be conserved in order to save work!

Let us now consider the five pillars, and the general web suspended from nowhere, that are supposed to support the flimsy structure he pictures:

(1) Sealy claims firstly, and naively of all things, that the American amaryllid was *rare*. There is a treatise by Dr. J. Hill, "Outlines of a System of Vegetable Generation," London, 1758, that has a bearing on this question. The evidence about to be presented is especially valuable since it is brought out incidentally, and this type of evidence is considered by research workers in history as impartial and unbiased. This evidence is devastating as far as some of Sealy's arguments are concerned.

As a plant to illustrate his theory, Dr. Hill used not the Cape Belladonna that Sealy claims to have been more plentiful at the time, but none other than the *allegedly* then rare American amaryllid that Linnaeus was allegedly supposed to be ignorant of. But let Dr. Hill speak.

Dr. Hill, on page 11, says,—“I am extremely obliged to Mr. Lee, nurseryman at Hammersmith,⁵ who, for the space of six weeks, from the middle of February to the end of March, supplied me almost daily with fresh plants in flower for the experiments.” The book was published in 1758, only five years after the first edition of *Species Plantarum* and the plant must have been plentiful for some time, long before 1753, for anyone to have had such a large stock of it in 1758. Thus perishes the fable that it was rare, and out goes Sealy’s pillar number one for anyone who has grown the American amaryllid knows the large number of bulbs Mr. Lee must have had in order to deliver almost daily fresh flowers to Dr. Hill over a six weeks period. This shows the danger of jumping at conclusions on the basis of circumstantial and flimsy evidence.

(2) Comparisons of the objects of people’s enthusiasms are odious. Plant species are representatives of particular lines of evolution and are in the main appreciated as such. What anyone may think as to the beauty of any particular flower is hardly of taxonomic value. It is true that the Cape amaryllid is outstandingly beautiful, and the same may be said of the American plant. An impartial appraisal will show that one is delicately tinted while the other is gorgeously or resplendently beautiful, and both are outstanding. Who would ever dream of creating such an *invidious* distinction in this case and using it as a main point in deciding a case in nomenclature? Out goes pillar number two.

(3) If there are for any of us any uncertainties as to what is meant by the morphological description given by Linnaeus in 1753, we need only to rely on the *type illustration* cited by Linnaeus rather than any long-winded circumstantial evidence based on untenable suppositions that will never prove anything and that has come to plague us only after the 18th Century. That there was no confusion in 1758, we learn from Dr. Hill, who writes in the work previously cited, “I propose to trace these several parts in a plant, in which they are all large and conspicuous this plant is a species of *Amaryllis*, it is distinguished from the rest by the drooping position of the filaments, and it is native to the American Islands.” In a foot-note to this sentence he quotes,—“*Amaryllis spatha multiflora*, corollis campanulatis equalibus, genetalibus declinatis. Linn. Sp. 293.”

This statement is also devastating to Sealy’s argument for it shows what a contemporary of Linnaeus who knew the plant intimately considered as the true type. This work of course contains a plate that shows a plant that is identical with the type illustration referred to by Linnaeus. The fact that the scape is two-flowered in this case proves that “*spatha multiflora*” means “more than one-flowered” as used in this connection, and that the real distinction is based on the declinate gynoeceum as pointed out by Dr. Hill in 1758. There were illustrations of the Cape Belladonna available at the time, but Linnaeus did not choose any one of them, and that is the deciding factor.

It is of interest to note and *remember* what was said concerning the typification of Linnean species at the 6th. International Botanical Congress, Amsterdam, 1935. Dr. Mattfeld said that “the important thing

⁵On the way from London to Kew.

was to reach an unambiguous decision, but that it was better that this decision should be in harmony with established custom. In the special case of the treatment of Linnean species, the question was already decided by common usage: for the correct application of the Linnean species names was determined by means of the figures, etc., cited by him, and not by means of the specimens in his herbarium, which were sometimes wrongly determined. This procedure is in accordance with Art. B 54. Furthermore, if Art. A 54 were accepted, it would be necessary to declare as invalid all new combinations associated with wrong identifications” Dr. Sprague of Kew apparently approved this procedure for it is recorded that “Dr. Sprague referred to the case of *Oxalis corniculata* and *Oxalis stricta* in support of what Dr. Mattfeld had said as to the interpretation of Linnean species names by means of citations. Mr. A. J. Wilmott had shown (Jour. Bot. 1915, p. 172) that the names *O. corniculata* and *O. stricta* should be applied in accordance with the citations given by Linnaeus.” The reader will be interested to know that Article B 54 was adopted by the overwhelming majority of 217 votes to 40 votes. One can imagine what the verdict would be if the procedure of “blank” specimens, and *unlimited* circumstantial evidence were presented to the vote of the systematic botanists! Such a suggestion would be especially appalling when it is known that in this case there are unmistakable type-illustrations cited by Linnaeus *himself*.

Here Sealyan pillar number three crashes.

(4) With reference to the “blank” specimen of the Cape amaryllid in the British Museum need anything further be said? Can anyone imagine that Linnaeus used this specimen in such a way that we could today recognize it as the type-specimen, or even a *working* type-specimen whatever that may be, when he used such a distinct type-illustration of the American amaryllid? Confusion is impossible for we must give others credit for at least a minimum of intelligence even after they are dead. Pillar number four collapses.

(5) Sealy claims that Linnaeus made additions in the second edition of Species Plantarum and he refers to the illustration of Miller⁶, fig. 23, which also shows a genuine American Belladonna. It should be emphasized that *Linnaeus refers to the plate only*. It is clear that the Cape amaryllid is not considered by him. Pillar number five cannot support the Sealyan structure! C-r-a-s-h goes the entire structure.

* * * * *

We are concerned here with a case involving nomenclature only which has been well regulated. We put our reliance on a clear statement by Linnaeus in his first edition of Species Plantarum, 1753, a work that is the foundation of our nomenclature of vascular plants, and when he assigned the name *Amaryllis belladonna* to an American plant he automatically fixed all the other related species under the same generic name. *Rules of Nomenclature have not been made in jest*, but to stop everlasting word-juggling, hair-splitting and fanciful argumentation. If the rules fail here, other similar problems of nomenclature will come to plague us *ad infinitum*, and chaos will be the result.

⁶Miller, Philip. Figures of the most important, useful and uncommon plants described in The Gardeners Dictionary. Vol. 1, London, 1760.



Mrs. A. N. Steward

Dr. Albert N. Steward

See page 168

HEMEROCALLIS IN EASTERN AND CENTRAL CHINA

ALBERT N. STEWARD⁷*Department of Botany, University of Nanking*

During the past eight years botanical explorations have been carried on under the auspices of the University of Nanking in cooperation with the Arnold Arboretum and the Farlow Herbarium of Harvard University, as well as the New York Botanic Garden, reaching to several previously neglected areas in the eastern, central and middle western parts of China proper. In all of these regions *Hemerocallis* has been collected, but three of the localities merit special mention because of the unusual



Fig. 38. Daylilies and peanuts grown for food, Meng Shan, Shantung Province, China. Son Newton Steward, at age of 15 years, with book in hand.

interest of the forms discovered there, or on account of the manner in which the plants are cultivated.

Dr. A. B. Stout, Director of Laboratories at the New York Botanic Garden, has for some years been so enthusiastic in stimulating interest in *Hemerocallis* that he deserves credit for the collections which have been made, as well as for the breeding and other experimental work by which the material from China and elsewhere has been made to yield such striking and valuable ornamental forms.

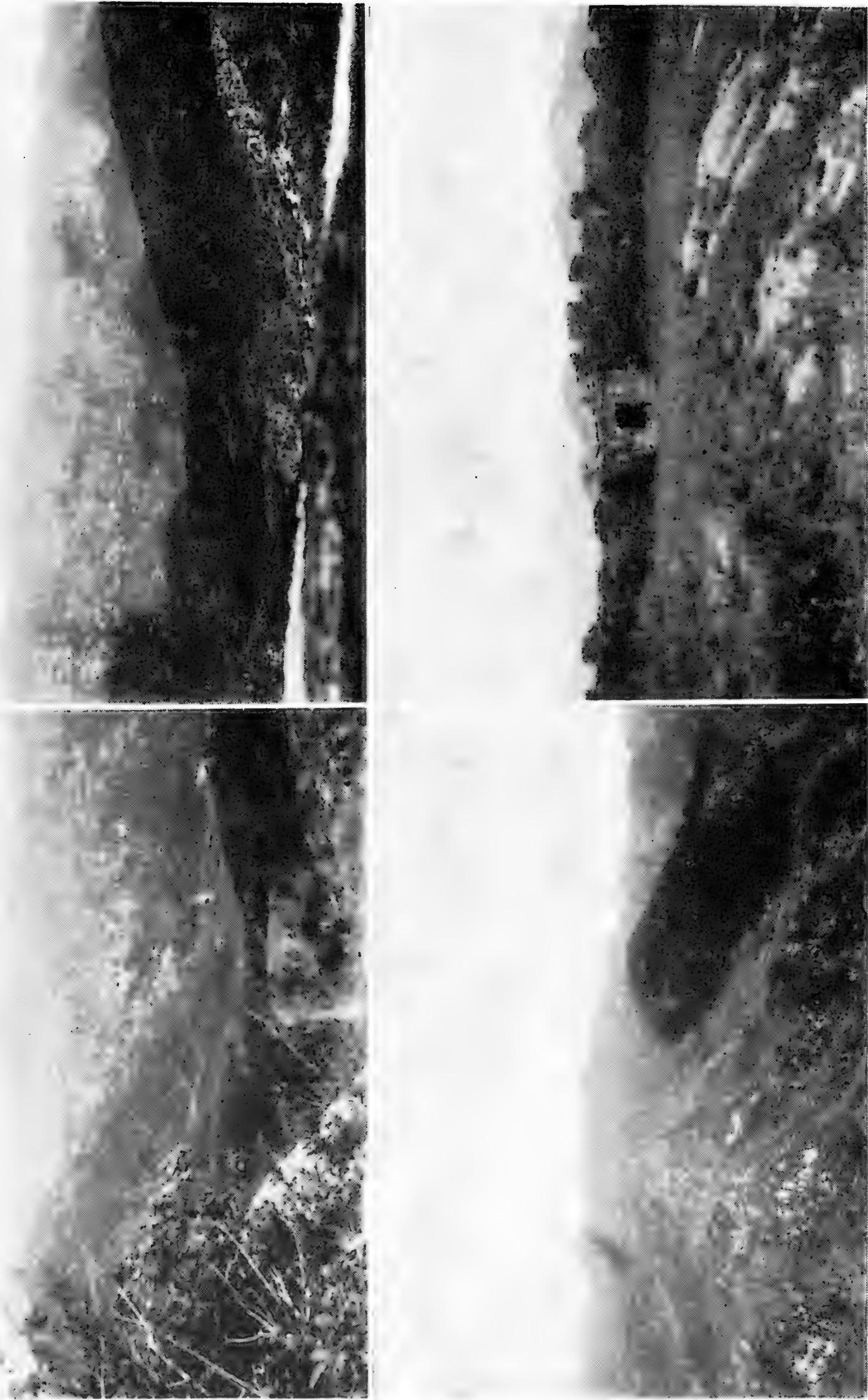
⁷Through the kindness of Mrs. Steward we secured a photograph of Dr. Albert N. Steward, and it is reproduced in Plate 156.



Lai Chong Photo, Shanghai & Kuling.

See page 171

*Native home of Hemerocillas fulva rosea—Lushan, or Lion's Leap Mountain,
Northern Kiangsi Province, China.*



See page 171

A. N. Steward, Nanking, China

Native home of Hemerocallis multiflora—Scenes near Kikungshan on Honan-Hupeh border, China. A deserted "City of Refuge," 1925, lower right.

Plate 158

Lushan, the mountain reaching an elevation of 1500 m., (See Plate 157), which lies just south of the Yangtze River, between Poyang Lake and the city of Kiukiang in northern Kiangsi Province, is perhaps the most interesting of the localities which have yielded material of unusual value.

The summer resort town known as Kuling is situated on this mountain at an elevation of about 1200 m. Motor cars, buses and rickshas operate over the road from Kiukiang to the base of the mountain, a distance of about 25 li (8 miles). The remainder of the journey to Kuling, about 15 li (5 miles), must be made on foot or by sedan chairs. All baggage and freight, including food supplies, fuel and building materials is carried up on the backs and shoulders of men. However, pianos and stoves are not uncommon at Kuling.

Lushan is surrounded by rich and intensively cultivated rice land for the terraces of which water is taken from the streams which flow out in all directions at the base of the mountain. No extensive forests remain here because the demand for fuel, especially for charcoal, has been so great that the woody vegetation of most of the slopes has been reduced to a cover of brush and small trees which is cut over every few years. There do remain, however, a few restricted areas of fine trees surrounding some of the temples. Also the Kuling Estate, where the summer homes are located, has been protected from cutting, some parts of it for twenty-five to thirty years.

The Fan Memorial Institute of Biology, in cooperation with the Kiangsi Provincial Government, has recently established the Lushan Botanic Garden and Arboretum, and extensive plantings are being carried on over the mountain. For the purposes of an arboretum it is happily situated in a central location as to the climate of China, being cool enough for most of the northern species, and yet warm enough for many of the southern subtropical species. A little snow falls every winter, and it is never extremely hot near the mountain top.

In moist, brushy or grassy situations on this mountain *Hemerocallis fulva* var. *rosea* occurs. The flowers are gathered by the Chinese and dried for use as a vegetable, the flavor of which they enjoy in certain meat dishes.

Kikungshan is a mountain on the border between Hupeh and Honan, (See Plate 158), near the railway running northward from Hankow to Peiping, on which is located the summer resort of that name. This area suffers a somewhat drier, colder winter than Lushan, and the elevation is not so high, probably not reaching 1000 m. The woody vegetation is less abundant, and many of the hills are covered only with grasses and low shrubs.

The people in this region have not enjoyed so prosperous an agriculture as those around Lushan, for they do not have moisture enough for so plentiful a winter crop, and many of their fields produce only one crop a year. On the hilltops one sees occasionally cities of refuge, (See Plate 158), built by the people as strongholds to which they might retire when attacked by bandits, who are usually roving bands of farmers whose crops have failed and who have become desperate for lack of food.

Hemerocallis multiflora occurs on Kikungshan.

In the vicinity of Meng Shan, not far from Chufu in western Shantung Province, tufted rows of a yellow-flowered *Hemerocallis* are cultivated on the margins of fields, (See Fig. 38), used for the Chinese (sweet) potato, peanuts or other crops. It is grown for the flowers under the name Huang Hua Ts'ai (Yellow Flower Vegetable). No evidence has been observed of the cultivation of *Hemerocallis* as an ornamental, except very recently, and in gardens under Western influence.

DAYLILIES RATED FOR GARDEN VALUE, SEASON 1938

GEORGE DE WITT KELSO, *Rhode Island*

The results of the third season's attempt to rate daylilies for garden value have now been compiled, and a summary is presented chiefly in the form of tables. The primary aim has been to prepare a standard *Grade A* list of 10 varieties (Table 1); general lists of varieties receiving more than 5 votes (Table 2), and those receiving less than 5 votes (Table 3); and to take a step toward the elimination of inferior sorts on the basis of a discard list (Table 4) representing the opinions of the voters.

For the season 1938, twenty-five voters participated and the results show a great variation of opinion indicating that the work should be continued until greater unanimity has been attained. The varieties *Fulva Cypriana*, *Gaiety* and *Hippeastrum* are the only ones receiving an unmixed vote in the class receiving more than 5 votes. The discard list (Table 4) is probably of the greatest value.

There has been a slight mix-up with reference to the method of rating. In 1938 *Herbertia*, page 138, the values assigned by the Editor were as follows: *a*, 9-10; *b*, 8-9; *c*, 7-8; *d*, 6-7. Anything below 7 was to be regarded as a discard. However, in the forms sent out for ratings, the following values were indicated: *a*, first class garden variety; *b*, good but ordinary variety; *c*, recent introductions, reserved for further test; and *d*, for decidedly inferior sorts, or discards. Some of those who sent in ratings used the first and others the second scale of values. Apparently in another year the recent introductions should be included in a separate table, and rated according to the first scale of ratings. The results are presented in the following tables, and you should draw your own conclusions.

After this paper was written, the Editor suggested that the best varieties should be presented on the basis of flowering season since the grower is very much interested in the 10 best varieties for the early, mid-season and late blooming periods. This is an improvement that should perhaps be tried out next season. If this is carried through, it should be pointed out, that it may happen that some of the 10 in the late flowering class, for instance, might not have the high "a" rating. However the grower might wish to get along with these until the breeders produce better ones. The Editor points out that a variety



Wyndham Hayward

See pages 155, 159 and 160

Hybrid Daylily varieties—Indian Chief (Traub, 1938), upper left; Florida (Hayward, 1937), upper right; Emperor Jones (Hayward, 1939), lower left; Duchess of Windsor (Hayward, (1938), lower right.

like *Queen of May* (rating 8.7) which has a consistent record for very early flowering (February) in Florida would most likely be included for an early list for that State. Similarly, a variety like *Dorothy McDade* (rating 7.5) would probably appear on a late list in the North.

These are matters that should be given attention in future attempts to rate daylilies for garden value. They are mentioned here as food for thought.

TABLE 1. Rating of daylilies for garden value; comparison of ratings of the first ten for the past three years.

SEASON 1936		Rating	Votes			
			a	b	c	d
1	* <i>Mikado</i> (Stout) -----	9.4	7a	1b		
2	* <i>Hyperion</i> (F. B. Mead) -----	9.4	7a	1b		
3	* <i>Ophir</i> (Farr) -----	9.3	6a	1b		
4	* <i>Golden Dream</i> (Betscher) -----	9.3	6a	1b		
5	* <i>George Yeld</i> (Perry) -----	9.1	5a	1b	1c	
6	<i>Goldeni</i> (Betscher) -----	9.0	4a	1b	1c	
7	* <i>Wau-Bun</i> (Stout) -----	8.9	5a	3b	1c	
8	<i>Cressida</i> (Betscher) -----	8.9	4a	2b	1c	
9	<i>Radiant</i> (Yeld) -----	8.7	2a	2b	1c	
10	<i>Soudan</i> (Stout) -----	8.5	1a	4b	1c	
* * * * *						
SEASON 1937		Rating	Votes			
			a	b	c	d
1	<i>Bijou</i> (Stout) -----	9.5	4a			
2	* <i>Mikado</i> (Stout) -----	9.3	6a	1b		
3	* <i>Ophir</i> (Farr) -----	9.1	6a	1b	1c	
4	<i>Pale Moon</i> (Cleveland) -----	8.9	3a	1b	1c	
5	* <i>George Yeld</i> (Perry) -----	8.8	5a	2b		1d
6	<i>Cressida</i> (Betscher) -----	8.7	4a	2b	2c	
7	* <i>Wau-Bun</i> (Stout) -----	8.6	1a	5b		
8	* <i>Hyperion</i> (Mead) -----	8.6	5a	2b		1d
9	* <i>Golden Dream</i> (Betscher) -----	8.6	3a	2b	2c	
10	<i>Mrs. A. H. Austin</i> (Betscher) -----	8.6	4a	1b	3c	
* * * * *						
SEASON 1938		Rating	Votes			
			a	b	c	d
1	* <i>Mikado</i> (Stout) -----	9.45	20a	1b		
2	<i>Patricia</i> (Stout) -----	9.37	15a		1c	
3	* <i>Hyperion</i> (Mead) -----	9.33	20a	4b		
4	* <i>Ophir</i> (Farr) -----	9.32	16a	6b		
5	<i>Anna Betscher</i> (Betscher) -----	9.21	15a	6b		
6	* <i>Golden Dream</i> (Betscher) -----	9.13	12a	7b		
7	* <i>Wau-Bun</i> (Stout) -----	9.13	12a	7b		
8	* <i>George Yeld</i> (Perry) -----	9.13	14a	4b		
9	<i>Bagdad</i> (Stout) -----	9.10	10a	4b	1c	
10	<i>Sunny West</i> (Sass) -----	9.07	11a	1b	1c	1d

*Varieties starred in this table appear among the first 10 in all three years.

OTHER VARIETIES RECEIVING 10 OR MORE A VOTES IN 1938

<i>Margaret Perry</i> (Perry)	9.00	10a	7b	1c	
<i>Cressida</i> (Betscher)	8.93	12a	7b	1c	1d
<i>Bijou</i> (Stout)	8.92	11a	4b	1c	1d
<i>Mrs. A. H. Austin</i> (Betscher)	8.89	12a	3b	1c	2d
<i>J. A. Crawford</i> (Betscher)	8.86	13a	6b	1c	2d
<i>Modesty</i> (Betscher)	8.78	10a	5b	1c	2d
<i>D. D. Wyman</i> (Betscher)	8.76	10a	5b	3c	1d
<i>Goldeni</i> (Betscher)	8.64	10a	7b	1c	2d

TABLE 2. Record of 150 Varieties Receiving 5 or More Votes.

	Votes	a	b	c	d
<i>A. E. Kunderd</i> (Kunderd 1934)	6		1	2	3
<i>Ajax</i> (Mueller 1908)	13	4	6	1	2
<i>Alba striata</i> (Perry 1934)	5		1		4
<i>Amaryllis</i> (Betscher 1932)	17	8	8		1
<i>Anna Betscher</i> (Betscher 1929)	21	15	6		
<i>Apricot</i> (Yeld 1892)	15	7	7	1	
<i>Aurantiaca</i> 1890	15	1	10		4
<i>Aurantiaca major</i>	10	1	5	2	2
<i>Aureole</i> 1903	16	5	7	1	3
<i>Bagdad</i> (Stout 1935)	15	10	4	1	
<i>Bardeley</i> (Perry 1932)	13	2	4	4	3
<i>Baroni</i> (Mueller 1903)	13	1	1		11
<i>Bay State</i> (Betscher 1929)	18	7	9	2	
<i>Beacon</i> (Betscher 1939)	5	1	2	2	
<i>Bijou</i> (Stout 1935)	17	11	4	1	1
<i>Burbank</i> (Burbank 1924)	8	1	3	2	2
<i>Byng of Vimy</i> (Perry 1931)	6	4	2		
<i>Calypso</i> (Burbank 1929)	20	9	7	1	3
<i>Chengtú</i> (Stout 1932)	6	5	1		
<i>Chrome Orange</i> (Mead 1933)	5	2	2	1	
<i>Cinnabar</i> (Stout 1931)	17	8	9		
<i>Circe</i> (Stout 1937)	6	2	2	2	
<i>Cissy Guiseppe</i> (Perry 1931)	14	2	4	3	5
<i>H. Citrina</i> about 1897	15	1	5		9
<i>Citronella</i> (Farr 1926)	6			2	4
<i>Cressida</i> (Betscher 1929)	21	12	7	1	1
<i>Crown of Gold</i> (Nesmith 1933)	7	2	3	2	
<i>Curlypate</i> (Scheffy 1935)	10	4	3	3	
<i>Dauntless</i> (Stout 1935)	11	7	3	1	
<i>Dawn</i> (Perry 1932)	7	1	2	2	2
<i>Dazzler</i> (Dreer 1937)	6	1	2	2	1
<i>D. D. Wyman</i> (Betscher 1925)	19	10	5	3	1
<i>Dover</i> (Betscher 1932)	14	5	2	3	4
<i>Dr. Regal</i> 1904	17	4	5	3	5

	Votes	a	b	c	d
<i>H. Dumortieri</i> 1834 -----	15	2	5	2	6
<i>Dumortieri-Sieboldi</i> -----	5	1	1	1	2
<i>E. A. Bowles</i> (Perry) -----	10	4	4	2	
<i>Earliana</i> (Betscher 1939) -----	8	6	2		
<i>Estmere</i> (Yeld 1906) -----	12	6	2	1	3
<i>Flamid</i> -----	9	1	4	1	3
<i>H. Flava</i> 1762 -----	18	7	5	3	3
<i>H. Flava</i> var major 1908 -----	13	3	4		6
<i>Flavina</i> (Fewkes 1934) -----	9	5	2		2
<i>Flore pleno</i> 1712 -----	7	1	5		1
<i>Florham</i> (Harrington 1899) -----	14	1	4	2	7
<i>H. Fulva Europa</i> 1762 -----	15	2	7	2	4
<i>H. Fulva</i> from Japan -----	5			2	3
<i>H. Fulva</i> from China -----	6	3	1		2
<i>Fulva Cypriana</i> (Sprenger 1907) -----	5				5
<i>Fulva maculata</i> -----	16	9	7		
<i>H. Fulva rosea</i> (Rosalind) -----	12	8	2	1	1
<i>Gaiety</i> (Betscher 1939) -----	6	6			
<i>George Yeld</i> (Perry 1926) -----	19	14	4		1
<i>Gladys Perry</i> (Perry 1931) -----	8	1	1		6
<i>Gloaming</i> (Cook 1936) -----	5	1	2	2	
<i>Gloriana</i> (Betscher 1940) -----	8	7		1	
<i>Golconda</i> (Farr 1924) -----	13		2	2	9
<i>Gold Dust</i> before 1906 -----	19	5	9	2	3
<i>Gold Imperial</i> 1925 -----	13	6	4	1	2
<i>Gold Standard</i> (Perry 1925) -----	12		3	2	7
<i>Golden Bell</i> (Wallace 1915) -----	13	3	6	3	1
<i>Golden Dream</i> (Betscher 1929) -----	19	12	7		
<i>Golden Empress</i> (Dennett 1936) -----	6	2	1	3	
<i>Golden West</i> (Sass 1932) -----	11	6	1	4	
<i>Goldeni</i> (Betscher 1929) -----	21	10	7	1	3
<i>Gracilis</i> -----	12	3	4	1	4
<i>Gypsy</i> (Betscher 1929) -----	17	8	5	1	3
<i>Harvest Moon</i> (Betscher 1929) -----	14	3	3	3	5
<i>Highboy</i> (Gray & Cole 1934) -----	9	3	2	2	2
<i>Hippeastrum</i> 1925 -----	7				7
<i>Hyperion</i> (Mead 1925) -----	24	20	4		
<i>Imperator</i> (Perry 1931) -----	13	5	5	3	
<i>Iris Perry</i> (Perry 1925) -----	18	8	8	1	1
<i>J. A. Crawford</i> (Betscher 1929) -----	21	12	6	1	2
<i>James R. Mann</i> -----	17	7	4	2	4
<i>J. S. Gaynor</i> (Yeld 1928) -----	6	2	2		2
<i>Kwanso</i> var fol. 1864 -----	11	3	3	3	2
<i>Lady F. Hesketh</i> (Perry 1924) -----	9	3	2	3	1
<i>Lemona</i> (Betscher 1928) -----	16	4	6	4	2
<i>Lemon King</i> (Betscher 1932) -----	13	4	4	1	4
<i>Lemon Queen</i> (Farr 1926) -----	5		1		4
<i>Linda</i> (Stout 1936) -----	8	7		1	

	Votes	a	b	c	d
<i>Lovett Lemon</i> (Van Fleet 1915) -----	12	2	6	2	2
<i>Lovett Orange</i> (Van Fleet 1915) -----	7		2	1	4
<i>Luteola</i> (Wallace 1900) -----	12	2	3	2	5
<i>Luteola grandiflora</i> (Lemoine '08) -----	5			1	4
<i>Luteola major</i> 1932 -----	13	3	3	2	5
<i>Luteola pallens</i> (Lemoine 1907) -----	7		3		4
<i>Mandarin</i> (Farr 1924) -----	12	2	3	4	3
<i>Marcys Perry</i> (Perry 1932) -----	10	6	2	1	1
<i>Margaret Perry</i> (Perry 1925) -----	18	10	7	1	
<i>Mary Florence</i> (Betscher 1934) -----	8	4	2	2	
<i>Mary Stoker</i> (Perry 1932) -----	5	1	1	1	2
<i>May Sadlier</i> (Perry 1934) -----	6	3		1	2
<i>Midas</i> (Stout 1935) -----	15	5	4	2	4
<i>Middendorffiana</i> 1878 -----	8		1	2	5
<i>H. Middendorffii</i> 1856 -----	13	2	5	3	3
<i>Mikado</i> (Stout 1931) -----	21	20	1		
<i>H. Minor</i> 1768 -----	16	5	7	3	1
<i>Miranda</i> (Yeld 1929) -----	5	2	1		2
<i>Modesty</i> (Betscher 1929) -----	18	10	5	1	2
<i>Mrs. A. H. Austin</i> (Betscher 1929) -----	20	12	3	3	2
<i>Mrs. C. S. Leith</i> (Betscher-----)	5	3		2	
<i>Mrs. J. R. Mann</i> 1930 -----	7	2	1		4
<i>Mrs. Perry</i> (Perry 1925) -----	8	2	2		4
<i>Mrs. W. H. Wyman</i> (Betscher 1929) -----	17	7	7	3	
<i>H. Multiflora</i> 1929 -----	8	4	1	2	1
<i>Nocerensis</i> (Perry 1930) -----	7	1	2	2	2
<i>Ochroleuca</i> (Sprenger 1903) -----	12	1	2	1	8
<i>Olif</i> (Nesmith 1934) -----	12	2	2	2	6
<i>Ophir</i> (Farr 1924) -----	22	16	6		
<i>Orangeman</i> 1906 -----	7	1	3	1	2
<i>Pale Moon</i> (Cleveland 1934) -----	10	4	1	3	2
<i>Parthenope</i> -----	8	1	1	2	4
<i>Patricia</i> (Stout 1937) -----	16	15		1	
<i>Pollyanna</i> (Nesmith-----)	7	1	3	2	1
<i>Queen Mary</i> (Perry 1925) -----	6	3	2		1
<i>Queen of May</i> (Lemoine 1925) -----	16	8	5	1	2
<i>Radiant</i> (Yeld 1925) -----	18	9	5	2	2
<i>Rajah</i> (Stout 1937) -----	12	7	3	2	
<i>Royal</i> 1925 -----	18	4	10	2	2
<i>Semperflorens</i> (Van Tubergen '25) -----	6		3	2	1
<i>Seranade</i> (Stout 1937) -----	7	4	2		1
<i>Shirley</i> 1926 -----	8	2	3		3
<i>H. Sieboldi</i> -----	9	2	2	1	4
<i>Sirius</i> (Yeld 1930) -----	12	6	4	2	
<i>Sir M. Foster</i> (Mueller 1904) -----	20	5	10	2	3
<i>Sonny</i> (Stout 1935) -----	12	9	1	2	
<i>Soudan</i> (Stout 1931) -----	14	7	4	1	2
<i>Sovereign</i> (Yeld 1906) -----	16	4	5	4	3

	Votes	a	b	c	d
<i>Stalwart</i> (Cook 1935) -----	5	1	1	3	
<i>Star of Gold</i> (Sass 1934) -----	7	2	2	2	1
<i>Summer Multiflora Hybrids</i> -----	6	2	1	2	1
<i>Sungold</i> (Dreer 1937) -----	5		3	2	
<i>Sunkist</i> (Perry 1932) -----	7	1	1	2	3
<i>Sunny West</i> (Sass 1932) -----	14	11	1	1	1
<i>Sunset</i> (Perry 1932) -----	9	2	1	1	5
<i>Tangerine</i> (Yeld 1906) -----	11	4	5	2	
<i>The Gem</i> (Betscher 1929) -----	15	3	9	1	2
<i>Thelma Perry</i> (Perry 1925) -----	5		1	1	3
<i>H. Thunbergii</i> 1873 -----	19	2	5	3	9
<i>Vesta</i> (Stout 1931) -----	17	6	9	2	
<i>Viscountess Byng</i> (Perry 1931) -----	11		5	2	4
<i>Vulcan</i> (Stout 1937) -----	8	6		2	
<i>Wau-Bun</i> (Stout 1929) -----	19	12	7		
<i>Winsome</i> (Yeld 1925) -----	14	5	7	1	1
<i>Wolof</i> (Stout 1936) -----	5	3	1	1	
<i>Woodlot Gold</i> (Cleveland 1934) -----	7	3	2	1	1
<i>Yellow Hammer</i> (Perry 1925) -----	7		3	1	3

TABLE 3. Record of 148 Varieties Receiving Less Than 5 Votes.

Votes					Votes				
	a	b	c	d		a	b	c	d
1 <i>Afterglow</i>	1a				26 <i>Dwarf Yellow</i>				1d
2 <i>Aloma</i>	1a	2b			27 <i>Earliest Lemon</i>			2c	1d
3 <i>Amos Perry</i>	1a				28 <i>Eldorado</i>				1d
4 <i>Araby</i>	3a				29 <i>Elemense</i>				1d
5 <i>Aurelia</i>	1a				30 <i>Eliz. Pyke</i>		1b	1c	1d
6 <i>Aztec Gold</i>	2a		1c		31 <i>Emily Hume</i>	1a	1b	2c	
7 <i>Beauty</i>				1d	32 <i>Erika</i>				1d
8 <i>Berenice</i>				1d	33 <i>Everblooming</i>			1c	
9 <i>Bernstein</i>			1c		34 <i>Flame</i>				2d
10 <i>B. Latham</i>		1b		2d	35 <i>Flamea</i>				1d
11 <i>Brownie</i>	1a				36 <i>Flavo-citrina</i>				1d
12 <i>Burgundy</i>	2a			1d	37 <i>H. Forestii</i>		2b		
13 <i>Burmah</i>	2a		1c		38 <i>Framingham</i>			1c	1d
14 <i>Buttercup</i>				1d	39 <i>Francis</i>				1d
15 <i>Ceres</i>				1d	40 <i>Fulcitrina</i>				1d
16 <i>Charmaine</i>	2a				41 <i>Fulva longituba</i>			1c	1d
17 <i>Chisca</i>			2c		42 <i>Fulva speciosa</i>				1d
18 <i>Chrysantha</i>			1c	1d	43 <i>Fulvax</i>				1d
19 <i>Chrysolora</i>				3d	44 <i>Fulvola</i>	2b			
20 <i>Corona</i>			1c	1d	45 <i>Garden Gold</i>	2b	1c		
21 <i>Crown Prince</i>		2b			46 <i>Gay Day</i>	3b			
22 <i>Dainty</i>		1b			47 <i>Giant Orange</i>	1a	2c		
23 <i>Dawn Play</i>			1c		48 <i>Giantess</i>		1b		
24 <i>Dora Wyman</i>				1d	49 <i>Gigantea</i>		2b		
25 <i>Dorothy McDade</i>			2c		50 <i>Glow</i>				1d

Votes					Votes						
		a	b	c	d			a	b	c	d
51	Gold Ball				1d	98	Rhodos			2c	
52	Golden Fulva	1a	1b			99	Robin Redbr'st	2a			
53	Graminea crocea				1d	100	Rosa Key	1a		1c	
54	Harriet Moore				3d	101	Rose Queen			1c	1d
55	Helen Campbell		1b	1c		102	Rutilans				2d
56	Herbert Spencer				1d	103	Salem		1b		3d
57	Hermes				2d	104	The Saracen	1a			1d
58	Jubilee	2a		1c		105	Saturn	2a			
59	June Boissier	2a	1b	1c		106	Semeramus			1c	
60	Keston				1d	107	Serena	1a			1d
61	Large Gold		1b	2c		108	Sharon		1b		
62	Lemonetta				1d	109	Shekinah	1a			1d
63	Louise		1b			110	Shippan				1d
64	Low Growing				1d	111	Sir William		1b	1c	1d
65	Luteola pallida	1a				112	Sprengeri				2d
66	Majestic	2a		1c		113	Springtime				2d
67	Marigold			1c	3d	114	Starlight	1a	1b		1d
68	Mars				2d	115	Summer Eve	1a			1d
69	May Morn			1c	1d	116	Sunbeam				1d
70	May Queen	1a	1b	1c	1d	117	Taruga	1a	1b		
71	Mehami	1a				118	Theron	2a			
72	Middendorfii major				1d	119	Todmorden				1d
73	Moidore			1c		120	Urmiensis				1d
74	Moonlight			1c		121	Winnie Night- ingale	1a			
75	Moonstone	1a		1c	1d						
76	Mrs. C. S. Leith	1a				122	Wm. Deam				1d
77	Mrs. Visseaux			1c		123	Wonder Gold		2b		1d
78	H. Mullieri		1b		1d	124	Yellow Wonder				2d
79	Multiflora Isis			1c	1d	125	*R 4-3		1b		
80	Multiflora luna			1c	1d	126	*R 303	1a			
81	Nada	2a				127	*R 1 No. 1	1a			
82	H. Nana	1a		1c		128	*Golden Orange	1a			
83	Omphale	1a				129	*?		1b		
84	Orange				4d	130	*R 3 No. 2	1a			
85	Orange Glow		1b	1c		131	*R 5 No. 1	1a			
86	Orange King				3b	132	*Sunshine				1d
87	Orange Vase				1d	133	*Little Gem				1d
88	Oriole		2b			134	*Golden Queen		1b		
89	Pandora			1c		135	*Golden Dawn		1b		
90	Peachblow	1a		1c	1d	136	*Craemore				
91	Pink Lustre			1c			Ruby	1a			
92	Pioneer				1d	137	*Fulva rosea	1a			
93	H. plicata			1c	1d	138	*Beloit			1c	
94	Princess Eliz.	1a				139	*Bouttoniere	2a			
95	Ralph Schrieve	2a				140	*Crepe	1a			
96	Rayon d'Or		1b	1c		141	*Fulva varie- gata	1a			
97	Reggie Perry	1a	1c								

Votes					Votes						
		a	b	c	d			a	b	c	d
142	* <i>Kwanso</i>					145	* <i>Mrs. Garlock</i>			1c	
	<i>ginia</i>	1a				146	* <i>Mrs. Crawford</i>	1a			
143	* <i>Fisher</i>			1c		147	* <i>Golden</i>				
144	* <i>Golden Byng</i>						<i>Mammy</i>	1a			
	<i>of Vimy</i>			1c		148	* <i>Large Yellow</i>	1a			

*Varieties written in by voters.

TABLE 4. Record of varieties receiving 5 or more discard votes (Discard List); and varieties receiving 3 or 4 discard votes (Danger List).

DISCARD LIST	DANGER LIST (Continued)
<i>Baroni</i>	<i>Goldeni</i>
<i>Cissie Guisseppe</i>	<i>Gypsy</i>
<i>H. Citrina</i>	<i>Harriet Moore</i>
<i>Dr. Regel</i>	* <i>Mandarin</i>
<i>H. Dumortieri</i>	<i>Middendorffii</i>
<i>Flava major</i>	<i>Orange King</i>
<i>Florham</i>	<i>Salem Daylily</i>
<i>H. Fulva cypriana</i>	<i>Shirley</i>
<i>Gladys Perry</i>	<i>Sir M. Foster</i>
<i>Golconda</i>	<i>Sovereign</i>
<i>Gold Standard</i>	<i>Sunkist</i>
<i>Harvest Moon</i>	<i>Thelma Perry</i>
<i>Hippeastrum</i>	<i>Yellow Hammer</i>
<i>Luteola</i>	<i>Alba striata</i>
<i>Luteola major</i>	<i>Aurantiaca</i>
<i>Middendorffiana</i>	<i>Dover</i>
<i>Ochroleuca</i>	<i>H. Fulva Europa</i>
<i>Olif</i>	* <i>Citronella</i>
<i>Sunset</i>	<i>Gracilis</i>
<i>H. Thunbergii</i>	<i>James R. Mann</i>
	<i>Lemon King</i>
	* <i>Lemon Queen</i>
	<i>Lovett Orange</i>
	<i>Midas</i>
	<i>Mrs. J. R. Mann</i>
	<i>Mrs. Perry</i>
	<i>Orange</i>
	<i>Parthenope</i>
	<i>H. Sieboldi</i>
	<i>Viscountess Byng</i>

*These varieties have been discarded by the Farr Nursery Co.

ON THE STATUS OF THE DAYLILY¹EDWARD STEICHEN, *Connecticut*

I would like to report to the Society the impressions obtained in considering the daylily situation at the present time. In this connection I must state in advance that I am definitely influenced by what I consider to be a changing condition in the American horticultural picture now under way. For a great many years, the horticultural world has been talking about the growing interest in flowers throughout the country, particularly as a result of the work of the various garden clubs and garden federations. In fact, some authorities have been repeating this with such regularity that they have apparently failed to notice that the prediction has been realized and that it is erroneous to refer to the garden club movement as a potential force, and that the thing to do instead is to take stock of the significance and value of their achievements. I have no accurate statistics as to the increase in the number of amateur gardeners during the last fifteen years, but it is quite evident by the growing importance of our gardening magazines and the increasing interest shown by most magazines and newspapers in the subject of popular gardening that the growth has been spectacular. Such an increase and the still increasing growth is bound to have an influence and bearing on questions of production and distribution of perennials. If a few thousand clonal propagations of a new perennial might have been sufficient for average national distribution fifteen years ago, today in order to give national distribution to a new perennial, with all of the incurrent expense of publicity required to reach and interest the gardening public, a stock of at least one hundred thousand plants would need to be propagated. In spite of the improvements and speeding up of propagation methods as published in *HERBERTIA*, the daylily is still relatively a very slow propagator. I doubt whether any wholesale grower could afford to tie up the necessary capital long enough to produce a hundred thousand daylilies of one named variety for national distribution. Experience with several perennials, notably *Delphinium*, would seem to indicate that if the new colors in daylilies are to get into general circulation within a reasonable length of time it will have to be through the medium of seed propagation rather than clonal propagation. It presents the relatively simple proposition of fixing the general type of color so that they will reproduce with reasonable fidelity from seed. This has been done successfully by several *Delphinium* breeders. Up to five years ago, it was considered impossible by most growers and even breeders to fix the colors of the garden hybrid *Delphinium*. By that time I had proven by my own experience that the fixing of color, type and stature of *Delphinium* was a result readily achieved by standard breeding practice; and within the last two years Frank Reinelt has placed over two hundred pounds of *Delphinium* seed on the market,

¹Col. Edward Steichen is the Chairman of the Daylily Committee, and we are all very grateful to him for his stimulating report. His recommendations I am sure will have great weight with all who grow and appreciate daylilies, and the gardening fraternity in general.—Ed.

which seed produces plants that are as well fixed as to color as are some annual flowers that have been on the market as fixed colors for years and years. Dr. Leonian has been marketing seed of daylilies for the last three years that has produced a large proportion of red and dark colored types. This year he has offered seed in separate and differing colors, and I do not doubt but that a large percentage of these will come reasonably true to color description. I have heard a rumor that a Pacific Coast grower is inter-crossing the fulvous and dark colored daylilies and setting out plants by the hundred thousand with a view to marketing the seed. I am bringing up this item, not as a news bulletin, but as a matter for consideration in connection with the various projects of evaluating existing daylilies now under way and being considered.

Due to the magnificent breeding work of Dr. Stout, the daylily has come into the running of the garden picture as a perennial with a future. This is not due to the fact that the publicity naturally attending Dr. Stout's fine achievements has stirred up the knowledge of daylilies themselves, but it has stirred the interest of the public because they believe they are going to get something better than what they have heretofore known as daylilies. If the best daylilies that Dr. Stout has produced during the last ten years could by some miracle suddenly become available to every gardener in the country I haven't the slightest doubt but what all but a very few of the previously known varieties would be willingly junked by any discriminating gardener. At the rate these daylilies are being propagated and disseminated now it will take at least ten years before they can achieve anything like a general distribution and a popular valuation. In the meantime, more breeders are taking up the work, and the problem of evaluating named varieties becomes still more complicated. For one thing, I cannot see much sense in trying to evaluate varieties that have already obviously been superseded and consequently have no value, and I do not see how we can evaluate new varieties which are not yet out of the breeder's or the distributor's laboratories and nurseries. I find that a daylily has to be established in one spot for three years before it gives a normal performance. Therefore, we cannot vote on the value of a new variety until we have had the plant growing in a comparative plot, next to the varieties with which it is to be compared, for three years. If gardener "A" has a plant of "*Hyperion*" growing in his garden, he can only say that he likes "*Hyperion*" or does not like "*Hyperion*." If gardener "B" grows "*Hyperion*" and also grows "*Patricia*," he is in a position to vote which of the two he likes best; but the usefulness of his vote is strictly limited to the fact that as between "*Hyperion*" and "*Patricia*" he likes one or the other better. His vote has absolutely no general rating value. There are a few private growers and institutions that have reasonably large collections of old and modern daylilies. If the varieties in these collections are all planted in like surroundings and conditions, any person having the interest and willingness to make a daily visit throughout the season to such a collection can give a truly comparative vote of personal opinion. If twenty-five individuals would make such

a study in various localities and then vote upon and rate all these very same varieties of daylilies, the average of such a rating would certainly be of tremendous value to retail and wholesale distributors, as well as to all gardeners. A rating produced by any less inclusive system than this would have more or less value depending upon how great would be the deviation. At the rate new varieties are being placed on the market, it is easy to foresee that within a few years they could easily run into hundreds each year. It would be entirely unreasonable to expect any institution or any amateur or grower to acquire and grow each and every variety that over enthusiastic growers may place on the market. I think it would be fairer to limit these ratings to such varieties as are listed for sale by at least three different dealers. This would place something of a damper on the appearance of entirely untried new varieties.

In the meantime, I hope that all members of the Amaryllis Society will give their active support and cooperation to the tests, trials and check-ups that are being conducted by the Massachusetts State College Field Station, Cedar Hill, Waltham; by George DeWitt Kelso, of Providence, Rhode Island; and by Elmer A. Claar, 1301 Chestnut Avenue, Wilmette, Illinois.

Anyone at all interested in the subject should visit Dr. Stout's daylily test plots at the New York Botanical Garden at any time during the spring, summer or fall. Here the range of new colors can be found in bloom throughout the season and comparison may readily be made between the new Stout hybrids and all of the older and some of the newer varieties by other breeders and growers.

Unfortunately, I cannot speak with first-hand knowledge of the work and achievement of the Florida breeders, particularly when they are to be considered outside of their own surroundings. It is quite likely that Florida and California with their advantageous growing conditions will in the future produce results more rapidly than can be achieved in the North. These will merely require testing in our more rigorous Northern climate.

I hope that all breeders and growers of new varieties of daylilies who are planning to distribute their clonal propagations will use all possible restraint in the release of new varieties. A plethora of new named daylilies that will turn out to be mediocre or too much alike will do great harm to the present "forward march" of the daylily. We can all continually bear in mind that novelty is outlived by true beauty.

DAFFODIL VARIETIES: WORK IN PROGRESS AND FOOD
FOR THOUGHTJAN DE GRAAFF, *Oregon*

I noticed some time ago that in order to prevent duplication of effort a book is being prepared reporting on the various scientific investigations in progress. It is interesting to note that as far as horticultural investigations are concerned, there is very little chance of unnecessary repetition. Experiments made abroad should be tried out here to discover whether, for instance, bulbs grown in the United States react the same way as Dutch or English bulbs. Especially in hybridizing there seems to be no possibility of duplication of effort. Over a period of years, crosses made at my farms using the same parents have shown the most delightful and interesting differences and the number of variations in color or form is without limit. Our program has been made up to cover several very definite experiments. One is to breed towards more perfect pink-cupped daffodils. Another is to bring hardiness and disease resistance—such as we find in *King Alfred*—to some of the other types of flowers. A third is to give several of the finest recent Dutch introductions such as *Scarlet Leader*, *Bertha Aten* and others, the length of stem they need to become popular in this country for outside plantings.

A great number of hand pollenized crosses are made by us annually and a most careful record is being kept. Of several of these, second generation flowers will be available next year and we can then embark upon the third generation crosses. Even with the best of care we cannot expect flowers in our climate before the fourth year and as a matter of fact it usually takes six years from seed to get really full-strength blooms. It takes us, therefore, some eighteen years to raise three generations of seedlings. Compare this with the fine work of Mr. David Burpee who has sometimes raised three generations of nasturtiums in one year and it is obvious that our progress must necessarily be slow. Yet we consider this breeding work of sufficient importance to devote a great deal of time and money to it. In spite of the fact that there are now some *eight thousand* named varieties of daffodils, there is still room for more. As a matter of fact, some of the latest seedlings raised in this country show so much progress and seem to be so much better adapted to our peculiar conditions of climate and temperature that we have great hopes that eventually we will no longer be dependent on foreign sources for our new daffodils. In this connection I might mention that, among others, Professor Sydney Mitchell of Berkeley, California, has already small stocks of several magnificent new hybrid daffodils which in the writer's opinion are as good as, if not better than, the latest English or Dutch introductions.

It might be worthwhile here to point to the great difference that exists in the life history of a daffodil hybrid as compared to, for instance, a new rose. Mr. Pyle assured me the other day that there are some twenty-four thousand named varieties of roses listed in a French publication of some twenty years ago. By breeding towards greater disease

resistance, greater hardiness and better flowers, the turnover in rose varieties is tremendous. Varieties hailed only five years ago as excellent novelties have fallen by the wayside and have been superseded by still better varieties. In the average garden we find that after several years the roses, due to neglect, insufficient pruning or other causes, deteriorate and that replacements are made with newer and, generally speaking, better varieties. The same thing does not at all hold true for daffodils. Varieties of fifty years ago—such as *Sir Watkin*, *Seagull*, *Emperor*, *Golden Spur*—are still being grown in large quantities and many of these old-timers are still very beautiful and useful for naturalizing purposes. The variations in size, form and coloring of the daffodil are infinite and they are all so pleasing to the eye that I venture to say that in its proper setting, any daffodil taken at random from the Classified List of the Royal Horticultural Society would give pleasure to the gardener. The popularity of certain varieties is, in my opinion, due not only to the beauty or perfection of the flower or to the number of awards it has gained at shows, but to a host of other reasons. A flower is liked because of the stamina of the plant, that will grow well under adverse conditions and will continue to flower freely even if undisturbed for years. If, when cut, it lends itself to pleasing arrangements and will last long in the dry, warm air of most living rooms, then it is indeed bound to be a success. From the growers' standpoint, of course, a natural selection will be made out of those varieties which propagate fastest and are least troubled with fungus diseases. The fact that some varieties produce a large percentage of well-shaped bulbs and that others split so badly that it is hard to select nice bulbs for store-trade also plays a role. The fact that some varieties can be forced into flower early in the season, has played an important part in the relative importance of certain varieties, although this is largely offset by the new discoveries about cold-storage treatment. We thus see that the mere excellence of a daffodil flower on the show table is not the only, or even the decisive, factor in its popularity and that the fact that a variety has been superseded as an exhibition flower does not by any means spell its doom.

Yet commercial growers are confronted with the necessity of limiting their production to a number of varieties which can be readily sold. This again is limited by the space the distributors can give to daffodils in their catalogs and since the public is interested in obtaining several varieties of each of the seventeen divisions and sub-divisions of the daffodil family, the choice has been narrowed to some hundred varieties. I might quote the experience we have gained here at the Oregon Bulb Farms. Starting in 1928 with over 1,200 varieties obtained from the best sources in Holland and England, we narrowed this down to approximately eight hundred in the course of four years. Out of these eight hundred we selected again about three hundred varieties as "most likely to succeed." At the present time we grow about 120 kinds in large quantities and have some three hundred other varieties which we grow in smaller lots mainly for the very limited demand from more advanced amateurs. While for hybridizing purposes we buy additional varieties

from year to year, we bring in only from one to three bulbs of each of these and only when by comparative study we find that one of these is very desirable from all points of view do we obtain additional stocks. Any new addition to our list of varieties produced in quantity means the elimination of one of the older varieties on this list. Such discards, together with the many second rate seedlings which are produced annually, are sold to the trade as mixtures for naturalizing.

As a strictly wholesale grower we have to introduce new varieties through the established distributing channels, which in our case generally means through the retail catalogs of our customers. Here several factors enter into play. To be economical and efficient, a catalog cannot be drastically changed from year to year. According to expert advice a variety has to be offered for several years before the public will turn to it and order it in any appreciable quantities. In order to encourage the sale of new varieties it has become more and more imperative to have good color plates made of them and to get publicity in the horticultural papers. The cost of all this is obviously very high and is often at least partially borne by the grower. Considering the extremely small margin of profit in daffodil production, neither the grower nor the retailer can afford to make a mistake. For both of them it is of the greatest importance to offer a list of varieties, that is as good and complete as can be made.

Since the reader may be interested in the final selection we have made after some ten years of testing in different climates and soil conditions, I shall cite it below. While this list has been made up most carefully, since obviously the success of our enterprise depends on it, I should be the first to concede that it is a highly personal selection and that my preferences, likes and dislikes have played a large role. Yet I feel that no one can take exception to the statement that considering limitations of price, quantity production and availability of the varieties concerned, this list is as good a *basic* one as can be made. I believe that it represents as fine an assortment and as inexpensive a one as can be made today and that starting with this group of varieties a magnificent collection can be built up. Each kind has been chosen for its peculiar merits, such as sturdiness, perfection of form, size, coloring, flowering time, etc., etc. Some six weeks of bloom can be had from the varieties mentioned, starting the season with some of the miniatures and with *February Gold*, that beautiful *N. cyclamineus* hybrid, and ending it with the graceful, fragrant flowers of *N. poeticus recurvus*.

THE CLASSIFICATION OF DAFFODILS

The Royal Horticultural Society's Classification of Daffodils to which is added a group of the most outstanding and typical varieties in each division: a collection of fine varieties for the advanced amateur.

Division 1. Trumpet Daffodils.

Distinguishing character—Trumpet or crown as long or longer than the perianth segments.

- (a) Varieties with yellow or lemon-colored trumpets, and perianth of same shade or lighter (but not white).

Aerolite, Alaska, Alasnam, Ben Hur, Cleopatra, Diotima, Matamax, Tresserve, Warwick.

- (b) Varieties with white trumpet and perianth.

Ada Finch, Beersheba, Eve, Jungfrau, La Vestale, Mrs. E. H. Krelage, President Carnot, W. P. Milner.

- (c) Bicolor varieties, i. e., those having a white or whitish perianth and a trumpet colored yellow, lemon, or primrose, etc.

Jefta, Robert E. Lee, Silvanite, Spring Glory, Victoria.

Division 2. Incomparabilis.

Distinguishing character—Cup or crown not less than one-third but less than equal to the length of the perianth segments.

- (a) Yellow shades with or without red coloring on the cup.

Abelard, Carlton, Croesus, Donatello, Helios, Lucinius, Micareme, Red Cross, Sir Watkin, Walter Hampden, Yellow Poppy.

- (b) Bicolor varieties with white or whitish perianth, and self-yellow, red-stained, or red cup.

Bernardino, Dick Wellband, Francisca Drake, John Evelyn, Maude Adams, Milford-Haven, Red Shadow, White-well.

Division 3. Barrii (incorporating Burbidgei).

Distinguishing character—Cup or crown less than one-third the length of the perianth segments.

- (a) Yellow shades, with or without red coloring on the cup.

Anna Croft, Barrii Conspicuus, Bath's Flame, Mrs. Barclay.

- (b) Bicolor varieties with white or whitish perianth and self-yellow, red-stained, or red cup.

Alcida, Diana Kasner, Firetail, Fleur, Lady Moore, Mayflower, Niobe, Seagull, Shackleton, Sunstar.

Division 4. Leedsii.

Distinguishing character—Perianth white, and cup or crown white, cream or pale citron, sometimes tinged with pink or apricot.

- (a) Cup or crown not less than one-third but less than equal to the length of the perianth segments.

Betsy Penn, Daisy Schaffer, Gertie Millar, Louis Capet, Silver Star, Suda, Tunis.

- (b) Cup or crown less than one-third the length of the perianth segments.

Hera, Mrs. Nette O'Melveny, Mystic, Queen of the North, Radio, Tullia.

Division 5. Triandrus Hybrids.

All varieties obviously derived from *N. triandrus*.

- (a) Cup or crown not less than two-thirds the length of the perianth segments.

Moonshine, Pearly Queen, Queen of Spain.

- (b) Cup or crown less than two-thirds the length of the perianth segments.

Agnes Harvey, Mrs. Alfred Pearson, Thalia.

Division 6. Cyclamineus Hybrids.

All varieties obviously derived from *N. cyclamineus*.

Beryl, February Gold, March Sunshine.

Division 7. Jonquil Hybrids.

All varieties obviously derived from Jonquils.

Campernelle Single, Campernelle Double, Chrysolite, General Pershing, Golden Sceptre, Lady Hillingdon, Lanarth, Orange Queen, Trevithian.

Division 8. Tazetta (Garden Forms and Hybrids).

To include the Poetaz varieties and the Dutch varieties of *Polyanthus Narcissus*.

Admiration, Cheerfulness, Frans Hals, Glorious, Golden Perfection, Klondyke, Orange Cup, Medusa.

Division 9. Poeticus Varieties.

Actaea, Comus, Edwina, Homer, Ornatus Maximus, Recurvus, Rupert Brooke, Snow King.

Division 10. Double Varieties.

Argent, Daphne, Dubloon, Indian Chief, Irene Copeland, Mary Copeland, Snowsprite, Texas, The Pearl, Twink.

Division 11. Various.

To include *N. Bulbocodium*, *N. cyclamineus*, *N. triandrus*, *N. juncifolius*, *N. Jonquilla*, *N. Tazetta* (wild forms such as *N. canaliculatus*), etc.

Note: The pink cupped varieties such as *Mrs. R. O. Backhouse*, *Love-nest*, *Rosabella*, *Sublime*, have purposely been eliminated from this list. They are all on the borderline of White Trumpet-Leedsii groups and it is the writer's opinion that they well might be classified separately, since they are a very distinct group.

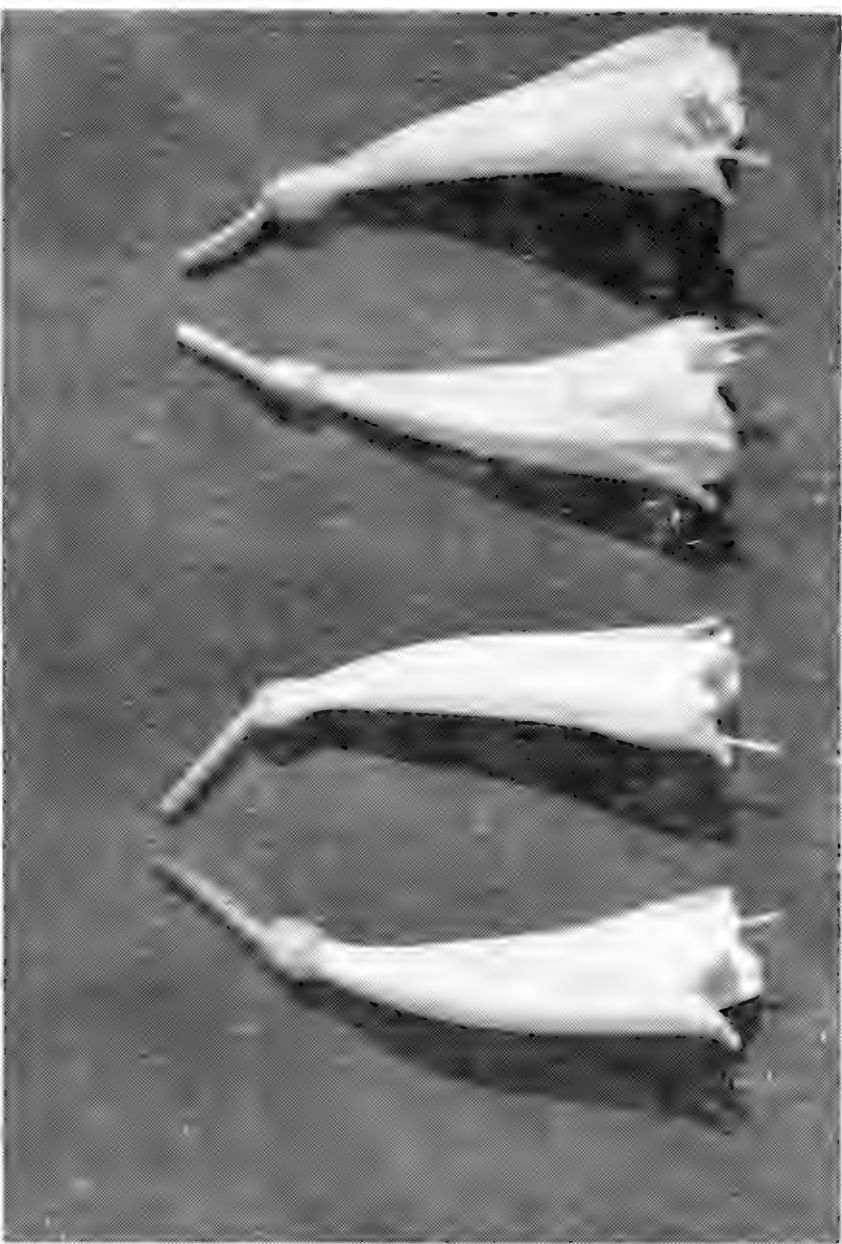
Any gardener growing a collection consisting of the varieties mentioned would have a most complete and distinct group of daffodils, well worth exhibiting at any daffodil show.

 CLIVIA GARDENI HOOK

Through the kindness of Dr. R. A. Dyer of the Union Department of Agriculture and Forestry we present the very interesting illustration (Plate 161) of *Clivia Gardeni* Hook., which is native to the Transvaal. The specimen illustrated is cultivated by W. Terry in Johannesburg, and was photographed by Dr. Dyer in May 1939. The *Clivia* breeders in America will be particularly interested in it as a possible parent in hybridizing.

In the next issue of *Herbertia* will be articles detailing the results secured by American *Clivia* breeders. Some of this material has already been received.

—Ed.



Gladys I. Blackbeard, Grahamstown, South Africa

See page 191

Clivia breeding—*C. nobilis*, upper left; *C. miniata* var. *flava*, upper right; hybrid between the preceding lower left; flowers of *C. nobilis* (left) and *C. miniata* var. *flava* (right), lower left.

4. CYTOLOGY, GENETICS AND BREEDING

CLIVIA BREEDING

GLADYS I. BLACKBEARD

Scotts Farm, Grahamstown, Cape Province

Of the many interesting flowering plants of South Africa, the Genus *Clivia* is worthy of special mention. It consists of handsome plants with dark green leaves and strong erect stems which carry massive flower heads in brilliant shades of nasturtium red to copper and gold. Even in winter they are most attractive pot plants with ever-green leaves and brilliant red fruits.

My early interest in the genus *Clivia* was awakened by my mother, who was deeply interested in South African flowers and gardening generally—an art almost neglected by women folk at that time. Gardening brought her into contact with many flower lovers and gardeners of the old type. She was fortunate in making the acquaintance of an old English gardener, who came to South Africa. He soon saw the possibilities of exporting bulbs, etc. to England. He collected the very handsome *Red Clivia*, *C. miniata*, (see Plate 160) and presented my mother with one plant. As a child I well remember the joy of seeing it bloom each year. It increased and after many years has come to be considered almost as a family heirloom. I was fortunate in securing another plant from a friend, the origin of which she could not give. The flowers are of pale apricot tint, having broader and more widely spreading perianth lobes (see Plate 160).* This gave me an inspiration and soon I made a cross between these two. Some five and a half to six years later the progeny flowered. The cross had considerably enhanced colour and form, from the palest to deep shades, with larger flower heads and broad petals—truly a beautiful show. Year after year I made crosses from the best plants and today those early crosses have multiplied to a family of some 2000 plants, from flowering plants to year-old seedlings.

Branching out from this family and making a fresh cross, I took again as my pollen parent the pale apricot one, and as the seed parent, a species that is indigenous to this part, *Clivia nobilis*, (See Plate 160). The flowers of this species are tube like and hang down in a massive cluster, being supported by a strong peduncle. This is in nature a very hardy and robust species—growing under various conditions in shaded moist kloofs some thirty-six miles away from the sea, down to within a few hundred feet from the sea shore, on the slopes of the hillside, in part shade from the tall tree *Euphorbia* on the banks of Bushmans River in the eastern Cape Province. In this particular spot *Clivia nobilis* has survived the damaging effects of man. Whereas most of the undergrowth has faded out with the advance of civilization the *Clivia* has persisted.

*It is probable that this is *C. miniata* var *flava* Phillips, which was figured and described for the first time in 1931 Flowering Plants of S. Afr. t. 411. It was discovered in North Natal about 1888 and a number of plants were distributed from the originals.



R. A. .Dyer, Pretoria

See page 189

Clivia Gardeni Hook. native to Transvaal; cultivated in Johannesburg by W. Terry; flowered in May-June, 1939.

Plate 161

The flowers of *Clivia miniata* var *flava* are erect or sub-erect whereas those of *C. nobilis* droop or hang their flower bells. The hybrids in this cross are somewhat varied in shade and form. The shades vary from dark to light apricot pink. They flower out of season, that is to say my general collection flowers in the spring, late August to September, whereas the *C. miniata* var *flava*-*C. nobilis* hybrids flower in May and a few in July, the flowering period having completely changed. If this will continue season after season is yet to be proved. This may be of immense value for making crosses with other related plants that bloom at this time.

From the time the seeds start to form, the capsules or fruits gradually develop to the size of a large cherry, but pear shaped. As they ripen they turn to brilliant scarlet and have a handsome appearance. It takes from ten to twelve months for them to ripen and they would remain on the plant much longer, but I prefer to remove the seeds as soon as possible before other flower buds appear. The seed may be gathered as soon as the fruits show any red colouration. After removing the pods I leave them for about ten days to two weeks after which I peel them and remove the seeds. The fruit contains an average of 5 to 7 seeds. One should not leave the seeds in their fruit pods too long for they will probably start growing and the delicate shoots may be broken off when removing the seeds.

When planting the seeds I use flat pans or boxes with moss at the bottom as drainage and then fill up with a light mixture of one part each of sand and leaf mould to two of good light garden soil, well mixed. Place the seeds in rows one inch apart, cover them with soil and give the seed pans a tap down by lifting up a little and dropping on the bench. Tap down at least twice. This settles the seeds into position. The pans or boxes can be their home for some time up to eighteen months or two years. When transplanting never give the seedlings much pot room, and never transplant until the roots are pressing above and over the side of the pot. They will flower well in 9 inch pots. Never "over-pot" *Clivia* plants as they will not flower, but only increase in leaf and root system. The secret of flowering them is rather to starve the plants than to over feed them. The general cry from most people is "my *Clivia* will not flower in spite of the fact that I keep potting it on." I always reply "Starve it." To enhance the bloom, when buds show, sprinkle round each plant a little well decayed mixture of horse and cow manure. This is all I have ever done for mine. For cultivation I have a "bush house" with flat roof, but before flowering it is advisable to put the plants under more shelter such as a glass house or verandah to protect the blooms from damage. Plants can be broken up and subdivided.

It must be remembered that all details given in this brief summary are purely the result of my own personal experiments, unaided in any way. Therefore my experiments have not advanced as rapidly as I should have wished. However many things have small beginnings, and the joy and keen interest shown in my collection has more than repaid me.

CYTOLOGICAL CONFIRMATION OF TAXONOMY IN COOPERIA*

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Until 1936 there were only three species that could be authentically placed in *Cooperia*. These were the two North American forms *Cooperia Drummondii* Herbert (with its variant—variety *chlorosolen* Herb.) and *C. pedunculata* Herb., and the Peruvian species *C. albicans* (Herb.) Sprague (see Hume, 1938). In the past three years the number of described species of *Cooperia*, apparently so far accepted by taxonomists as authentic, has been doubled. The three new species described are: *C. Traubii* Hayward (1936) from the Texas Gulf Coast, *C. kansensis* (1938) from Kansas, and a sixth form *C. Smallii* Alexander (1939) from South Texas, which is a lemon-yellow in color—rather than the standard white of previously described *Cooperias*.

Since 1936 the writer has made occasional cytological observations, chiefly chromosomal, on the three white *Cooperias* found in Texas. No material of *albicans* or *Smallii* has been available and *kansensis* has not yet been studied in any detail.

So far as is known no previous reports have been made on chromosome numbers in this genus. Numbers that may be reported here are:

<i>Cooperia Drummondii</i>	2n=48
<i>C. pedunculata</i>	2n=48
<i>C. Traubii</i>	2n=24

In all three species the chromosomes are comparatively large. This, coupled with the relatively large number of somatic (2n) chromosomes in the first two listed species makes it no easy matter to determine the numbers in these forms definitely. But the technique finally arrived at gave numerous plates for both species in which there seemed to be no doubt that 48 was the usual number. An exception should be noted: a few root tips secured from germinated seeds of *C. pedunculata* contained around 70, probably 72, chromosomes in dividing cells, but this number has not yet been observed in root tips of successfully surviving plants. The smaller number of chromosomes present in *C. Traubii* makes for ease of counting, and 24 is clearly the somatic number in the material examined of this species (Fig. 39). Preliminary observations indicate the same number of chromosomes in *C. Drummondii* var. *chlorosolen* as in *C. Drummondii*, and also that *C. kansensis* has in the neighborhood of 48 chromosomes; more definite reports on these forms will be given later.

The cytological evidence would seem to support the correctness of the present taxonomic position of *C. Traubii*. The lower chromosome number of this form offers an additional (perhaps the controlling) morphological distinction from *C. Drummondii* and *C. pedunculata*. Furthermore the cytological picture of *C. Traubii* supports the contention

*Technical contribution No. 539, Texas Agricultural Experiment Station.

made in its original description, that this species is more closely related to *Drummondii* than to *pedunculata*. In *C. Traubii* the chromosome pairs fall into the following wide types: 1 long pair with median constrictions, 1 medium-long pair with submedian constrictions, 8 medium-short pairs with subterminal constrictions, and 2 short pairs with median to submedian constrictions. In *C. Drummondii* the chromosome types are: 2 long pairs with median constrictions, 2 medium-long pairs with submedian constrictions, 16 medium-short pairs with subterminal constrictions, and 4 short pairs with submedian to median constrictions. In other words the chromosome types of the two species are practically the same, there are apparently just about twice as many of each type in *C. Drummondii* as in *C. Traubii*. The types of chromosomes in *C. pedunculata*, based on size and constriction position seem to differ in being

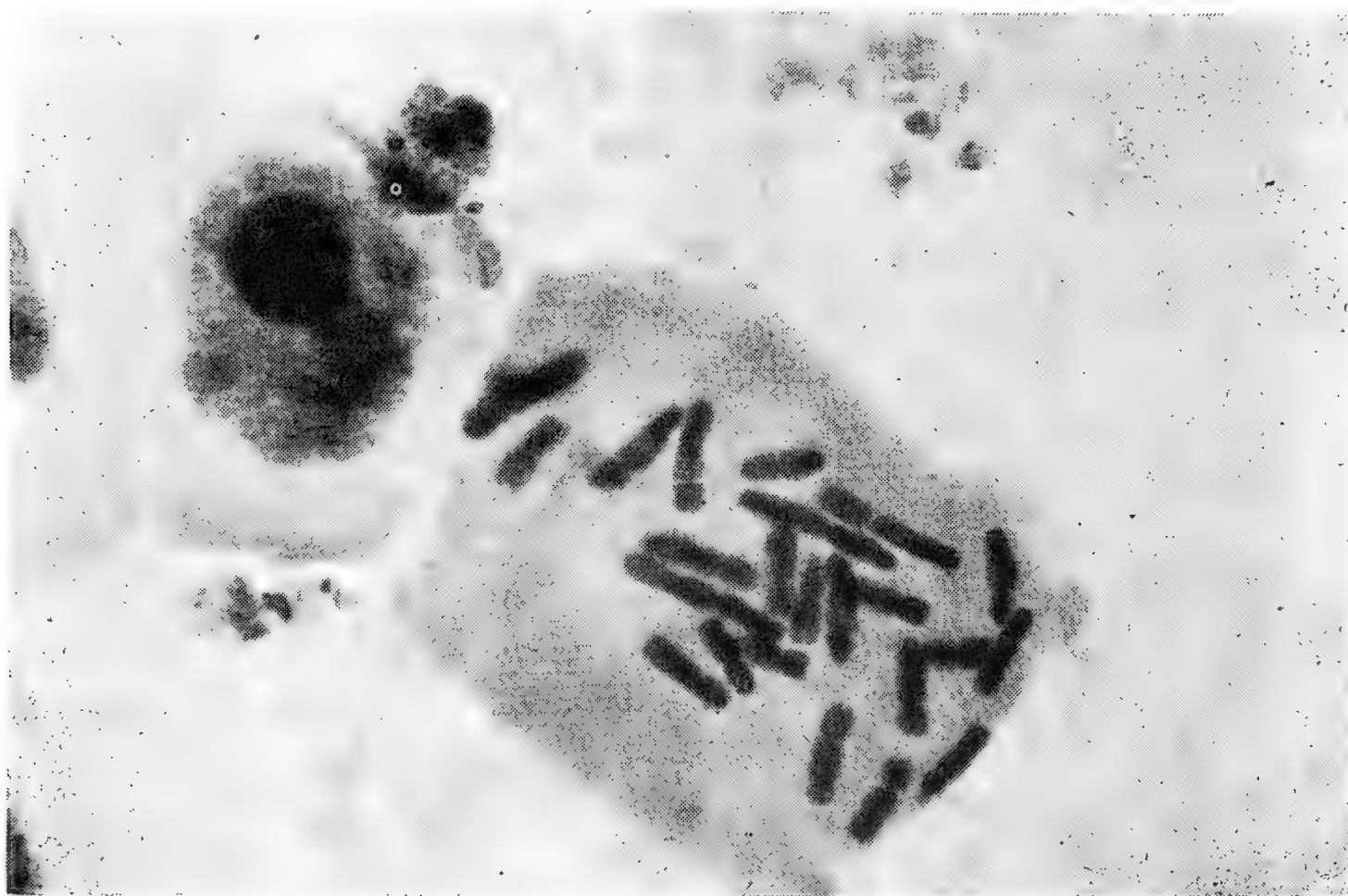


Fig. 39. Root tip cell of *Cooperia Traubii*, at right, showing 24 chromosomes; $\times 1250$. Note that 23 chromosomes are fully visible; that the 24th is under the one at the upper left in the cell and can be seen only in part.

more numerous and less easily classified into a few groups. On the basis of present data, which it is intended to expand, the types in *C. pedunculata*, ranging from longest to shortest pairs, approximate: 2 long pairs, submedian constrictions; 6 pairs, subterminal; 10 shorter pairs, subterminal; and, 6 short pairs, submedian. The size range within some of these groups is such as probably to necessitate a large number of groups for a definite classification of types. It will suffice here to point out that the chromosome types found in *C. pedunculata* seem to differ considerably from the types in *C. Traubii* and *C. Drummondii*.

The above discussion furnishes a simple and striking instance of the way in which cytological and taxonomic information supplement each other. Technique description, detailed data, and cytological figures will appear in a later report.

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PARTHENOGENESIS IN ZEPHYRANTHEAE

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A quarter of a century ago Pace (1913) published a paper under the title "Apogamy in *Atamosco*" which should be of interest to any one attempting crosses with species of *Zephyranthes*, *Habranthus*, *Cooperia* and perhaps related genera in tribe *Zephyrantheae*. Since the paper seems to be but little known, and also rather inaccessible to many amaryllid breeders, the editor of *Herbertia* has suggested that a review of this paper, with comments on it and on related phenomena, be given here.

Miss Pace worked at Baylor University, Waco, Texas, with presumably native material of *Habranthus texanus* Stendel (*H. Andersonianus* var. *texana* Herbert; *Atamosco texana* Greene;—see Flory, 1938). The parts of her paper describing unusual steps in the initiation and production of seed will be summarized below.

We will first state the case briefly. There is a failure of chromosome reduction in the steps leading to egg formation. The resulting eggs then have the same number of chromosomes, 24, as are found in the body, or somatic, cells. These eggs with the unreduced chromosome number are not only capable of developing into diploid sporophytes (plants with the usual chromosome number) without fertilization but they actually *will not* unite with the male gamete, although the nuclei of the two gametes are frequently in contact—according to Pace's work. The male gamete disintegrates as the egg develops into a new sporophyte.

Drawings and diagrammatic sketches showing approximate location of most parts mentioned in this paper, together with their reported scheme of development, are presented in Figures 40-A; 40-B and 41. These are explained, for the most part, in the legends and labels of the figures. In place of any nuclear detail, the number of chromosomes present in each nucleus is given in the sketches. Where new terms are encountered in the text of this paper, reference to the sketches should usually clarify them.

Now in slightly more detail Miss Pace's findings were as follows: No chromosome or nuclear divisions of the *Habranthus* megaspore-mother cell (the body cell which gives rise to the embryo sac, and, hence, to the egg) were observed. The embryo sac development was interpreted as being of the *Lilium* type, so the megaspore-mother cell division would also be the first nuclear division of the sac. The second division in the em-

*Technical contribution No. 538, Texas Agricultural experiment Station.

bryo sac (giving four nuclei from two) was never observed. The third division in the sac, however, was observed in a number of ovules—usually in the chalazal end of the sac. “In all cases approximately 24 chromosomes could be counted . . . therefore the reduction division seems not to have taken place.” Apparently there were only 3 divisions from the megaspore-mother cell to the complete 8-celled embryo sac. One of these 8 cells, of course, was the egg. Two of the remaining 7 cells were polar nuclei (nuclei which fuse with each other and with one of the sperm, or male gametes, to form the first endosperm nucleus) which followed the usual process of moving to the center of the cell prior to fusion. Late prophases, metaphases and anaphases of egg nuclei were seen, and figured, to have approximately 24 chromosomes.

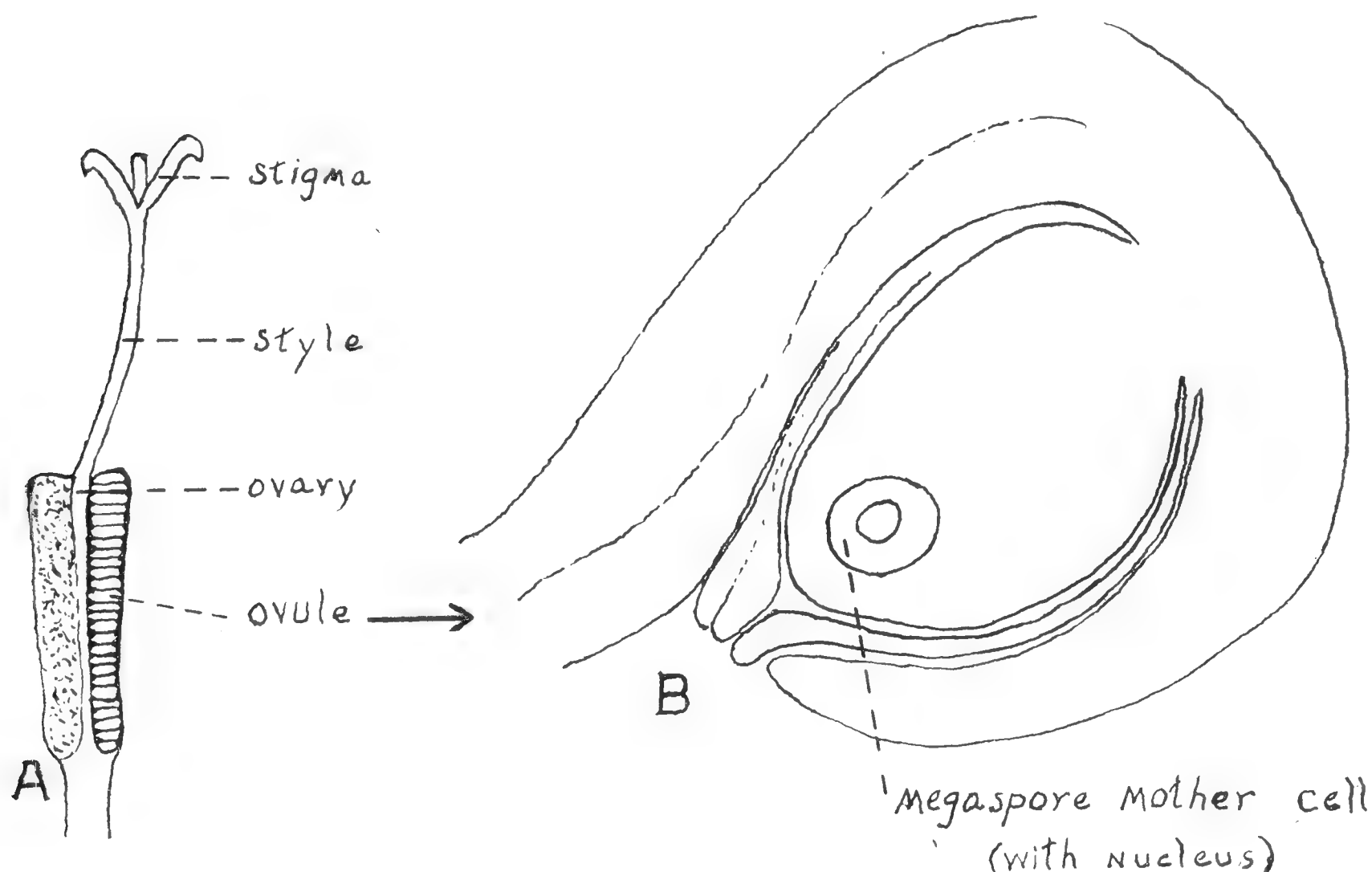


Fig. 40, A. Drawing of the pistil of an *Habaranthus texanus* flower at time of opening. A part of the ovary wall was removed to show one of the three columns of flattened ovules. The ovules are seen in side view here. Each column is composed of 25 or more ovules. 1.8 natural size.

Fig. 40, B. An enlarged, camera-lucida, drawing of a top view of one of the ovules—from the pistil drawn in Fig. 40, A. Note the megaspore mother cell. It is this cell that develops into the embryo sac (see Fig. 41), which contains the egg and later the young embryo. Sixty times natural size.

Pollen was observed to be normal in every way. Metaphase figures of the generative cell preparing for division showed 12, the reduced number of, chromosomes. Some of the male nuclei (sperm) present in egg cells (see below) were also seen to have “approximately 12 chromatic masses, apparently chromosomes.”

More than 600 cases were seen of a sperm nucleus within an egg cell in which the egg nucleus was in a resting condition. In only a few cases was the sperm nucleus in contact with the egg nucleus; never were the two nuclei seen fused. About 300 sacs were observed to have a sperm

nucleus in an egg cell in which the nucleus was in process of division—usually in the spirem stage of prophase. But no fusion of these nuclei (gametes) was ever observed. In fact it was only in the egg nucleus that prophase was initiated and the implication is given that no nuclear activity was exhibited by the male gamete. The fate of the male gametes was that of “finally disintegrating during the first division in the egg,” all signs of these being gone by the two-celled embryo stage.

The second male nucleus was seen in process of fusing with the two polar nuclei, and later stages showing the product of this triple fusion were noted. The triple fusion of these nuclei “seems the common condition in the material examined.” A number of chromosomes could be counted following the triple fusion, in some cases. In several instances one could count 50 and know there were still others. In one case “more than 60 chromosomes (could) be counted in all three (consecutive) sections.” Cut chromosomes might account for the apparent number being above 60. The number would be 60 if two polar nuclei with 24 chromosomes each fused with a sperm nucleus with 12.

There is apparently a question as to the correctness of Pace's use of the term “apogamy.” For a part of the time while she was studying this problem she worked—during the summer of 1910—in the laboratory of the famous German botanist Strasburger, at Bonn. Strasburger's interpretations and definitions of apogamy (especially as given in his 1909 paper) were accepted by Pace, in preference to Winkler's terminology (1908). Strasburger (and Pace) considered parthenogenesis to be the development of a new organism from a reduced (“haploid”) egg gamete. They considered other cases of new individuals arising from unreduced gametes without fertilization as being one type of apogamy. Winkler's considerations of parthenogenesis as involving the development of a new plant from an unfertilized gamete (reduced or unreduced in chromosome number) has been generally accepted outside of the Strasburger school. Among modern texts of a general scope Sharp's (1934) places the *Habranthus* (*Atamosco*) case, described above, as “unreduced parthenogenesis” and Darlington's (1937) borrows the term “diploid parthenogenesis” from Hartmann and Renner, to designate this and similar cases. In view of trends in terminology, then, we can probably speak more correctly of “parthenogenesis” than of “apogamy” in connection with the behavior described in *Habranthus*. Darlington (l.c.) states that the case described by Pace is “remarkable.” Apparently no duplicate case (of one male generative nucleus fusing with the two polar nuclei of the embryo sac so that the endosperm is sexually produced, while the second male nucleus does not fuse with the egg) has ever been reported.

That Pace considered the embryo-sac development in *H. texanus* to be of the *Lilium* type is stated above. Details of embryo sac development in the lily were worked out by Sargent in 1896 and were generally accepted as correct in all details for a number of years. Briefly the development was said to be as follows: Following megaspore mother cell formation there were two divisions to give four megaspores. None of the megaspores disintegrated (as occurs for the three nearest the micro-

pyle in the ordinary type of sac development). A third division then gave an 8 nucleated, mature, sac. Presumably each of the 8 cells had 12 haploid chromosomes. However since 1928 (15 and more years following Pace's report) the work of Bambacioni and her colleagues (1928a,b; 1930; 1932), of Cooper (1935) and of others, has shown that there are other steps in this process. There are *four* divisions between the megaspore mother cell and the mature 8 nucleated sac. The first two give rise to 4 nuclei, each with the reduced number of chromosomes. As the third division occurs three of these nuclei are in one (the chalazal) end of the sac, and their chromosomes become arranged on a *single* spindle. When the third division is complete there are still only four

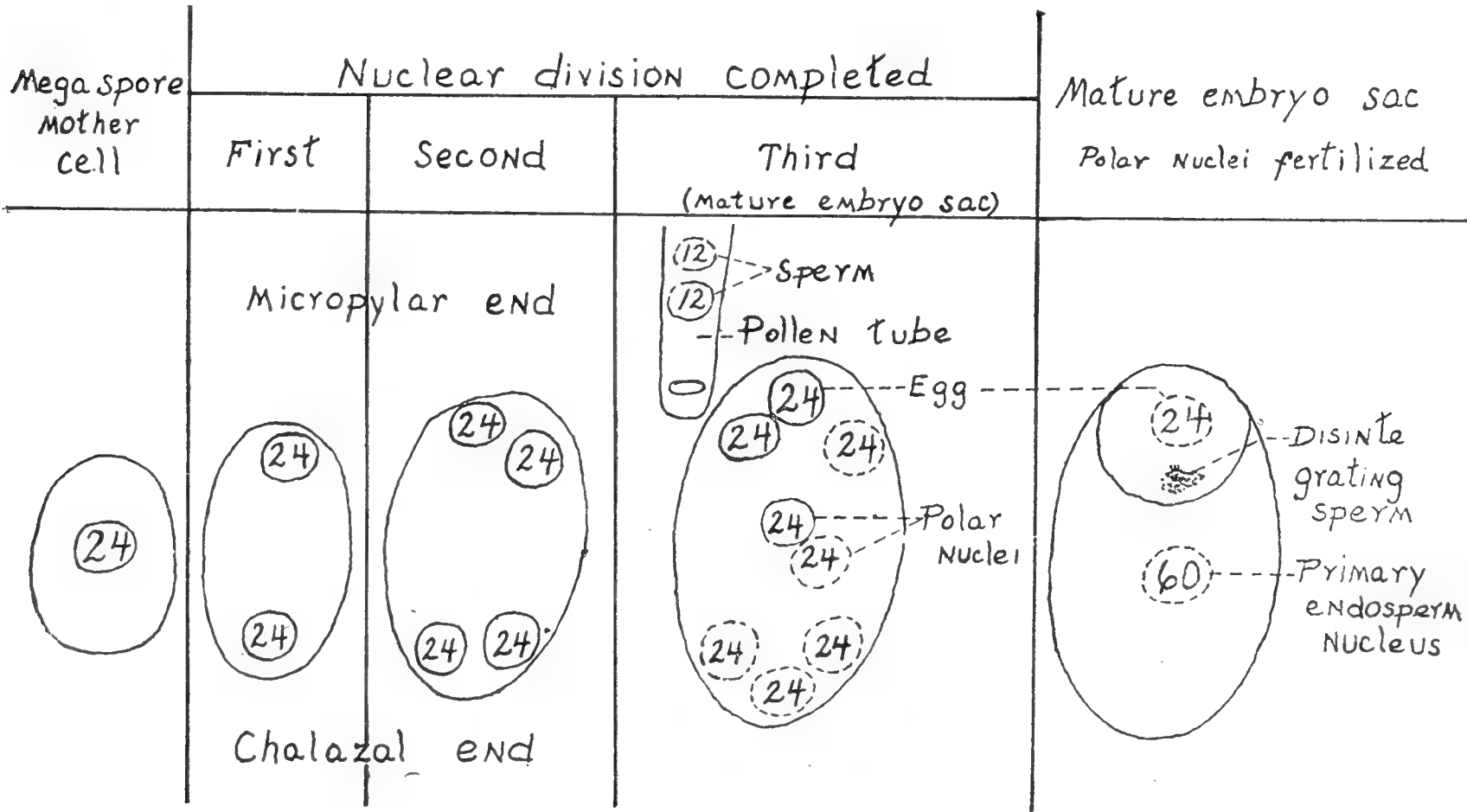


Fig. 41. Diagrammatic sketches of the steps in embryo sac formation in *H. texanus* (the Copper Rain Lily), based on Pace's report. Nuclei are shown as small circles. The number of chromosomes reported (in nuclei surrounded by broken lines) and presumed (in nuclei surrounded by solid lines) are given in each case. In most cases the reported numbers were "approximate" ones. The unreduced, diploid egg, denoted in the right hand sketch, develops into a new embryo, and plant, without fertilization—but probably in most cases only when the polar nuclei have been fertilized.

nuclei but two are large, with 36 chromosomes each, and the other two have the usual reduced number. Following the fourth division, of the eight nuclei four are large with 36 chromosomes, and four are small with 12 chromosomes. The egg nucleus is one of the latter. Of the two polar nuclei one is large, one small; after these fuse with the second male gamete, then, the triple fusion results in 60 chromosomes (the 5n number in the *Lilium* endosperm.)

In the light of her own observations Pace would scarcely have considered embryo sac origin in *Habranthus* as of the Lily type had she been aware of the situation revealed by later investigations. The chromosome numbers in the endosperm of *Habranthus* (more than 50,

about 60) would fit either with her observations, or with a *Lilium* type sac as known now. Also her observations on chromosome numbers, which showed more than the reduced number ("approximately 24") in the last division in the sac, were made almost entirely on divisions occurring in the chalazal end of the sac, because the majority of the divisions noted were found here. But while this latter fact, too, might be suggestive of the situation in Lily (and more especially of that in *Tulipa Gesneriana*—see Bambicioni and Giombini, 1930), there is the apparently incontrovertible fact of the unreduced number of chromosomes in the unfertilized and dividing egg, which would seem to decisively place the type of sac development here in a category of its own. This paragraph together with the preceding one, somewhat skirt the main issue, but are inserted because of the suggestiveness which the summarized facts might have in directing a reinvestigation of embryo sac development in *Habranthus*.

There is a small amount of genetical evidence available on this problem. In 1937 the present author pollinated, under control, 12 emasculated flowers of *Habranthus texanus* with *Cooperia pedunculata* pollen. Three weak sets gave a total of 8 seeds from which 6 plants were secured. All have leaves like the mother. Four have flowered and produced typical *H. texanus* flowers. The three plants in which the root-tip chromosome numbers have been studied each have 24. In the parents *H. texanus* had 24, *C. pedunculata* approximately 48 chromosomes. In other words the 6 plants from the carefully controlled cross do not appear to be hybrids at all, but are apparently pure *H. texanus*, parthenogenetically produced. Nine pollinations of the same cross in 1938 resulted in neither sets nor seeds. Twenty-four pollinations of the reciprocal cross—about half in 1937, half in 1938—gave neither sets nor seeds. In 1938 five flowers of *H. texanus* were emasculated and bagged, unpollinated. All five set pods, each of which contained about 6 seed, mostly abortive, with a total of 12 viable appearing seeds. The two plants secured from these have not flowered but will doubtless prove to be identical with their parent. Pollen is known to be comparatively very high in plant hormone content. It is possible that emasculation removes the source of hormones necessary for high percentage of seed set. With this in mind a technique to prevent self-pollination without anther removal is being planned both for a cross-pollinating, and for a bagged, unpollinated, series.

Mr. Wyndham Hayward, Secretary of the American Amaryllis Society, has informed me that he has made controlled pollinations on *Habranthus robustus* and *Cooperia pedunculata* using pollen of *Zephyranthes carinata* and of other *Zephyranthes* species. Good pods of seed were secured but all the progeny were good types of the maternal parent species with no hybrid or intermediate characters. This would sound very much as if parthenogenesis, perhaps similar in type to that described by Pace, has occurred in this material.

The present writer has made numerous pollinations on *H. robustus* using pollen of *H. texanus* with neither sets nor seeds resulting. A similar lack of positive results was the case when the same species was pollinated, under control, by *Z. carinata* and by *C. drummondii*. However,

only a very few flowers were used in the last two pollinations. From the crosses: *Z. simpsonii* x *Z. treatiae*; *Z. atamosco* x *Z. treatiae*; and, *Z. simpsonii* x *C. pedunculata* a number of seed and seedlings have been secured but these will not flower before 1940.

Mr. Percy-Lancaster (1936) has succeeded in securing a number of actual recombinations from his numerous crosses of *Cooperia* and *Zephyranthes* species. The name *Cooperanthes* has been given these bigeneric hybrids. However, from his descriptions one is led to believe that in some cases he, too, actually has parthenogenetic offspring and not true hybrids. He notes having secured, in the first generation, some plants of a parental type and some that were intermediates. As nearly as can be gotten from his paper it seems that usually where the offspring are of a parental type it is the maternal parent that is closely resembled. From the results of other workers, one would be tempted to think that some of these offsprings may be "maternals," while only the intermediate forms are true hybrids.

The results with unpollinated *H. texanus*, considered in the light of Pace's work, strongly suggests that where pollination occurs the subsequent fertilization of the endosperm supplies the factor and stimulus, needed for embryo and seed development; and, that usually, without pollination—and hence without endosperm fertilization—no seeds result. It is possible, and perhaps probable, that where *H. texanus*, or a similarly behaving species, is pollinated by a different species that the same phenomenon may occur—that is that the endosperm of the mother species may be fertilized by a different species and hence allow development of a seed, and perhaps eventually of a new plant; but if there has been no egg fertilization the new individual will be like the mother. On the other hand, of course, where conditions are such that egg fertilization will occur, true hybrids could be secured.

Summary and conclusions: The available genetic evidence seems to indicate that some form of apomixis (development of new individuals without fertilization), presumably parthenogenesis, occurs in several species of *Habranthus*, *Cooperia*, and *Zephyranthes* of the tribe *Zephyrantheae*. Pace has presented, in detail, the cytological evidence for this phenomenon in *H. texanus*. The combined genetic and cytological information suggest that pollination and endosperm fertilization are necessary before parthenogenetic development of the egg can proceed. Much more data is needed to present anything like a clear picture of what actually happens—of how extensive the situation is; of the various environments and physiological conditions under which it does or does not occur; if apomixis in different species is all of the same, or of different types; etc. It is to be hoped that others working with species of this tribe will present regular reports of their findings so that all may benefit from these individual experiences.

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ADVENTURES IN BREEDING RED HEMEROCALLIS

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Before they became available to the general public the varieties of red hemerocallis developed by Dr. Stout found their way into the gardens of the members of the board of directors of New York Botanical Garden. Some six or seven years ago I was fortunate in securing four unnamed plants of red hemerocallis from one of these gardens. The flowers varied from orange red to brownish red in color, and while judged by the present day standard they were nothing unusual, at the time they seemed startlingly beautiful to me. These unnamed seedlings constituted one line of parentage in my breeding program, while some of Perry's varieties formed the other. The first generation crosses yielded some very promising seedlings; maroon, deep rose, clearer red and old rose colored sorts were observed and separated for further breeding among themselves. The progenies of these came with much finer colors and added ruby red and purplish red colors to the increasing number of shades. However it remained for the third generation crosses (season of 1939) to bring forth the real "breaks."

Based entirely on my own seedlings, the red varieties may be divided into two primary groups: those possessing purple pigment, and those without such a pigment. The following colors come under the first group: blackish and lighter maroons, purplish red, old rose, and lavender pink. The second groups contains a larger number of representatives such as blackish reds with no trace of maroon, deep blood red, brownish red, ruby red, scarlet, deep rose, salmon pink, and flesh. In addition to the foregoing two primary color groups there are many bicolors and blends, such as splashes of red on yellow, salt and pepper effect, glowing and perfectly even blends of salmon and yellow that cannot be classified under either color, tan and brown combinations, brown and magenta effects, coffee and burnt orange, and many borderline colors impossible to define. Some of these are mere curiosities, but others possess an infinite charm.

According to their resistance to the sun the red shades may be divided into two groups: first, those that largely retain their original colors; second, those that fade very badly and become very unattractive, and third, those that become even more attractive after fading.

The sepals and petals show a great variation. Some are very long and narrow, others are broad. Some open funnel shape, others are flat. Some curl back like Martagon lily, others resemble amaryllis.

The height varies from five feet down to six inches. The dwarfs form a mound of narrow leaves, and the scapes may be taller or shorter than the leaves. The 4-5 inch flowers may be borne in clusters, in reduced clusters, or singly, and their colors vary from flesh pink or yellow to salmon, deep rose, lavender pink and deep red.

Undoubtedly some of the readers will think that in describing the colors of my seedlings I am indulging a bit too freely in what is known as poetic license. I can readily enough understand their reaction because before this year even I was somewhat skeptical concerning pink hemerocallis. I have had visitors who after seeing my seedlings admitted that previously they took all claims about red hemerocallis with a considerable degree of mental reservation. As red varieties become generally available this skepticism on the part of general public is going to give way to a healthy enthusiasm. We may not be able to develop a snow white hemerocallis, but pure purple and even blue varieties are not at all impossible, as the maroons, the purplish reds, and the lavender pinks are eloquent precursors of such varieties. After all, the breeders of hemerocallis are just beginning to flirt with the fascinating possibilities of colors that are so alluringly beckoning to us.

AMARYLLIS BREEDING

HERMON BROWN, *California*

My horticultural experience began on a Kansas farm where I was born and reared. At the age of eighteen, I began work in a small nursery, where I stayed four years, during which I learned the nursery business pretty thoroughly. After that I did a little farming and fruit raising, and then came to California to take charge of a large fruit ranch in the Santa Clara Valley. Two years later, I left for Salisbury, Rhodesia, South Africa where I remained for twelve years as Curator of the Public Gardens—a fifty-two acre park and ornamental grounds. With this I ran a nursery and was the City's only florist. The work was largely experimental since the country was new, the plants strange, and we were a thousand miles from any established nursery. In 1913 I returned to the Santa Clara Valley in California where I have remained ever since on the prune ranch which I own and operate.

I started my amaryllis work about twenty years ago when a friend gave me one bulb—hybrid amaryllis—which he had obtained from Luther Burbank. It had light-colored blossoms with red lines, good open flowers from six to seven inches, of good substance, and was a good multiplier. The next year I bought a dozen mixed bulbs from Mr. Burbank. The friend who had given me the original bulb had in the meantime acquired a nice little collection of selected bulbs from Howard & Smith, Tait, and Burbank. These were hand-pollinated with a collection belonging to still another friend, and the resulting seed was given to me to raise on shares.

From this seed I obtained my start of some seven hundred and fifty plants. I had a good range of color from almost white to very dark red, and from this excellent stock I have selected the best, stressing clear colors, good substance and erect carriage. By this careful selection and hand-pollination, I have made improvements particularly in substance of blooms and clearness of colors.

I have a good white with faint lines of red in the upper petals, others with stripes or feathered with red on white. One type that I particularly admire, from the Burbank stock, is white with heavy markings of deep red with a clear white border. There are flowers with fine red lines and spots; one of the best with the spots showing on the backs



Fig. 42. *Hermon Brown and his hybrid amaryllis.*

of the petals. There are reds with white throats. I have not had a really satisfactory light red until this year when several very good ones appeared. Only about four years ago I learned that the dark reds with green in the throat were objectionable. But I had a few all red and am now breeding from them. Recently I have added a pure white, an orange red and a near orange to my collection. I have plain petaled and ruffled, and some fragrant blooms.

I have not stressed size but have had blooms nine inches in diameter, which is not bad considering I have no artificial heat. I have a little green-house and light an oil heater to keep the plants from actually freezing during a few of the coldest nights.

I start my seeds in the house in flats or in beds, generally leave them for a year, and then plant them out of doors in beds six feet wide with twelve inch boards for sides. I plant them thickly, about four inches apart each way mixing in sandy loam and use barn yard manure as fertilizer. I leave them in these beds for two or three years until after some of them have bloomed, then I dig them, sell some of the blooming sized bulbs, and replant others in rows fifteen inches apart in the open garden to bloom and increase in size. The choice ones I pot and put in the house for my own pleasure, and for breeding stock. The bulbs planted out of doors I cover completely with soil to prevent freezing, for sometimes the temperature drops to as low as twenty degrees F. here.

I have not had the opportunity to see many other amaryllis collections. Since the formation of the Amaryllis Society in 1934 I have taken renewed interest. By comparing my amaryllis with the judging standards I can determine in what respects mine fall short and also those points in which mine excel. I have gotten in touch with other members of the Society, found out their ideals and have gradually been getting some of their seeds and a few bulbs. Soon now I will have these seedlings blooming and from these I hope to add new colors and shades to my collection. I have some seedlings of the variety *A. aulica* crossed with the *hybrids*, also my first crosses of the dark reds and pure white, which I am watching with interest.

ADDITIONAL NOTES ON AMARYLLIS RETICULATA-STYLOSA

HYBRIDS

SYDNEY PERCY-LANCASTER
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Years ago I crossed an out of season *Amaryllis stylosa* with *A. reticulata*, *Mrs. Garfield*. Among the seedlings there have been several slight variations in shade but two flowering in August this year are so distinct that I have dared to name them provisionally *Mrs. Lancaster*, and *Alipur Beauty*. A preliminary report on *Amaryllis reticulata-stylosa* crosses was presented in *Herbertia* 3:97. 1936.

The descriptions of the two named varieties follow:

MRS. LANCASTER: (*A. stylosa* x *A. reticulata striatifolia*, *Mrs. Garfield*) ; foliage dark green with a narrow greenish white stripe down the centre, length 16", width 2", the base of the under-surface flushed dull red, flower spike 24" long, four-flowered, individual flower diameter 4", petals reflexed and each slightly incurved, colour deep rose red with darker veinings, a white stripe running down the centre of each petal, pistil and stamens deep rose pink, pollen yellow.

The flowers are slightly larger than *A. stylosa*, and whereas the pollen of *Mrs. Garfield* is creamy white that of *Mrs. Lancaster* is deep yellow.

(Continued on page 238)

5. PHYSIOLOGY OF REPRODUCTION

TREATMENT OF AMARYLLID AND OTHER SEEDS WITH HORMONE POWDER

W. M. JAMES, *California*

Early in 1938 a powder called Rootone was put on the market. It is a mixture of naphthaleneacetic acid and talc. This mixture can be prepared by wetting talc with the proper solution of naphthaleneacetic acid and then drying it thoroughly, or by grinding the acid crystals into a very fine powder—even fine enough to go through a 320 mesh sieve—and then mixing it with the talc. Either method requires a certain amount of skill and some equipment to get a thorough, uniform mixture.

Seeds of *Sprekelia*, *Haemanthus Katherinae*, several forms of *Callicore rosea* (*Amaryllis belladonna* Herbert) and several selections of Callicore-Brunsvigia Hybrids, several kinds of *Iridaceae* and two kinds of annuals were treated with the Rootone powder before being sown.

The annuals were snapdragons and Bismarck stocks in various colors. All kinds showed a decided reaction almost from germination. The seedlings from treated seed had a better color and were ready to transplant into flats before the check seedlings were. This difference was maintained as long as observations were made—until nearly blooming time.

In the amaryllids included there were two distinctly different types of seeds. The *Sprekelia* has relatively small ones which are comparatively dry and which will stay viable for some time. They germinate in the open ground in from 4 to 8 weeks. All the other kinds have soft, fleshy seeds from 3/16 to 1/2 inch in diameter and under ordinary conditions they remain viable only 3 or 4 months. They generally germinate in the open ground in from 2 to 4 weeks. Seedlings from treated *Sprekelia* seeds were no different from plants from untreated seeds. Seedlings from treated seeds of all other kinds showed a definite advantage over the seedlings from untreated seeds. The leaves appeared quicker, and six months after planting were a third larger than those of the controls. Both treated and untreated seeds (controls) were planted in short rows in the open ground. Neither the seeds nor the seedlings were counted. However, it is quite noticeable that there was a better germination from the treated seeds.

The *Iridaceae* (*Gladiolus* spp., *Moraea* spp., *Streptanthera*, *Tritonia*, etc.) seeds which were treated showed no noticeable reaction. They were also planted in the open ground and require from 1 to 6 months to germinate.

The Rootone was applied by placing the seeds and a small amount of powder in a jar which was closed tightly and then shaking until the seeds were thoroughly coated. The excess powder was screened out before planting and used over again.

(Continued on page 239)

6. AMARYLLID CULTURE

REGIONAL ADAPTATION, SOILS, FERTILIZATION, IRRIGATION,
USE IN LANDSCAPE, DISEASE AND INSECT CONTROL ETC.

THE DISTRIBUTION OF SOUTH AFRICAN AMARYLLIDS IN RELATION TO RAINFALL

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The Union of South Africa lies between latitude 22°S and 35°S and consequently is, for the greater part, situated within the warm temperate belt but it extends into the tropics in the Northern Transvaal. The temperature is lower than might be expected since the elevation of the land is considerable and along the west coast it is lowered still further by the cold Benguela current. Due to its latitudinal position the seasons are well differentiated. The country is divisible into a coastal region with a small temperature range and the interior region which has a large temperature range. In the former, frosts are almost unknown but in the latter they are of frequent occurrence.

In regard to its water relations the country is essentially arid or semi-arid, with for the most part, a seasonal distribution of rainfall, a small number of rainy days (especially in Summer) and an excess rate of evaporation over precipitation. Nearly two-thirds of the country has a rainfall of less than 20 inches per annum and a great deal of it has less than 10 inches. High rainfall (60 inches and more) occurs only in small regions such as the higher mountain ranges and the escarpment in the northeastern Transvaal. The rainfall in general, decreases towards the west from a maximum on the east coast. Apart from the small rainfall, there is considerable irregularity in different years—bad droughts occurring fairly often. In consequence of the water economy the relative humidity is low, and clear, cloudless skies are characteristic of all seasons of the year. Over the greater part of the country most of the rain falls in summer but in the South-western parts 60 per cent or more of the total rainfall is in winter resulting in a Mediterranean type of climate. Winds are a much more prominent feature of the coastal region than of the interior.

In the accompanying map (Plate 162) it will be seen that the country has been divided into six regions on the basis of percentage rainfall in summer. I have attempted to correlate the rainfall with the distribution of the amaryllids but the figures given for numbers of species and genera occurring in these regions must be regarded as approximate since the field records are still incomplete and many records are as yet unpublished. More exact figures could only be obtained as a result of considerable work in all the South African herbaria.

The number of amaryllid genera and species occurring in each region has been ascertained as far as possible, and the chief characteristics and habits of the dominant genera have been considered for each

of the rainfall regions delimited below and shown on the map (Plate 162).

Region A.

Average annual rainfall: 0-10 inches.

Summer rainfall: 0-25 per cent of total.

Amaryllid genera: 10
species: 42

The genus with the greatest number of species occurring in this region is *Gethyllis* which has 13 species. *Gethyllis* could not, from the point of view of the field observer be said to be a prominent feature of the region since the plants are rather rare and scattered. The life history exhibits the most extreme characteristics of the ephemeral bulbs. The flowers appear after rain in mid or late summer and last for one or two days. In early winter the fruits are forced above the ground and subsequently the leaves emerge and remain green until early summer when they wither and die. These features are characteristics of all the other genera in this region with the difference that the fruit is produced immediately after the flowers and not after a lapse of about 3 months as in *Gethyllis*.

Region B.

Average annual rainfall: 0-10 inches in the Northern part, 10-40 inches in the South.

Summer rainfall: 26-40 per cent of total.

Amaryllid genera: 13
species: 42

The most prominent genera are *Haemanthus* and *Hessea* with 8 species each and *Nerine* with 7.

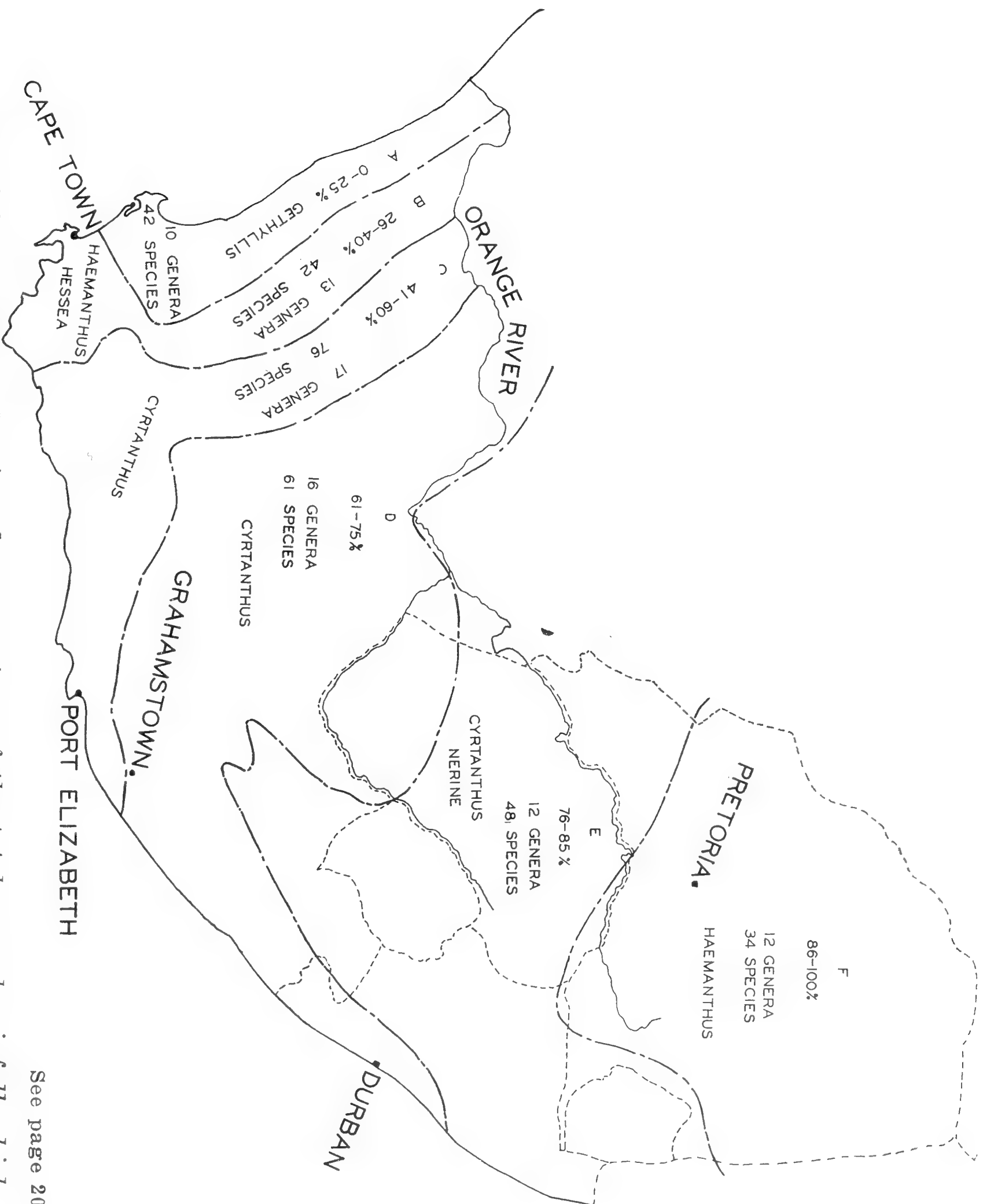
Nerine and *Haemanthus* are widely distributed throughout South Africa. All the species of these genera and other such widely distributed Amaryllidaceous genera which occur in the Western and South-western Cape region, lose their leaves in summer while the majority of the species of the same genera which are endemic to the eastern parts of the country retain their leaves throughout the year. Notable exceptions to this rule are *Agapanthus* and *Tulbaghia* which retain their leaves in the south western parts. In the case of *Agapanthus* several species which are found in the summer rainfall areas are deciduous. There are other genera such as *Nerine*, which have deciduous species some of which are confined to the eastern parts of the country, whereas the deciduous habit obtains for all the species occurring in the western winter rainfall areas.

Region C.

Average annual rainfall: 0-10 inches in the North, 10-30 inches in the South-east with small regions of 30-40 inches in the South.

Summer rainfall: 41-60 per cent of the total.

Amaryllid genera: 17
species: 76



See page 207

Map of South Africa showing the percentage of the total annual rainfall which falls in summer; within each division the percentage rain in summer, dominant amaryllid genus or genera and number of genera and species are indicated for each division. Based on R. S. Adamson—“The Vegetation of South Africa” p. 27. (After Cox).

In this region the dominant amaryllid genus is *Cyrtanthus* with 17 species. *Haemanthus* and *Nerine* are each represented by 11 species. The majority of the *Cyrtanthus* species are found in the South-eastern corner of the region where the rainfall is from 20-30 inches per annum.

In the drier parts the species are deciduous but in the areas with more rainfall in summer, i.e., towards the east, there are many species which retain their leaves.

Region D.

Average annual rainfall: Ranging from 0-10 inches in the west through 10-20 inches to a belt of more than 40 inches in the east.

Summer rainfall: 61-75 per cent of the total.

Amaryllid genera: 16
species: 61

Cyrtanthus has the greatest number of species in this region—namely 16. With the exception of about 4 species these are confined to the southern and eastern parts.

There are 10 species of *Haemanthus* and 9 of *Nerine*.

The species of the genera represented in this region are predominantly evergreen in habit.

Region E.

Average annual rainfall: Ranging from 20-30 inches in the western part through 30-40 inches to a belt with more than 40 inches in the east.

Summer rainfall: 76-85 percent of the total.

Amaryllid genera: 12
species: 48

In this region the genera *Cyrtanthus* and *Nerine* are of equal significance—each being represented by 13 species. The species of *Cyrtanthus* are distributed chiefly along the eastern coastal region. There are several species of *Nerine* which inhabit the central and inland parts. These exhibit the same characteristics as the amaryllids described for regions A and B, namely the leaves die away before the flower is produced.

Region F.

Average annual rainfall: For the most part 20-30 inches increasing to 40 inches and over in the eastern part of the region.

Summer rainfall: 86-100 percent of the total.

Amaryllid genera: 12
species: 34

The records to which I have had access for this region were far from complete. *Haemanthus* is represented by 4 species, *Nerine* and *Cyrtanthus* with 3 species.

From this analysis of the climatic conditions prevailing in South Africa in relation to the distribution of the amaryllids the following generalisations emerge:

1. The amaryllids prefer those parts of the country where the rainfall is more or less evenly distributed between the summer and winter seasons.

2. The plants are much more plentiful both in numbers of genera and of species in the moister parts of the country although they grow also in the most arid regions.

3. In the regions where the summer is very dry the plants lose their leaves before flowering.

4. In the summer rainfall regions leaves and flowers are usually present at the same time.

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AMARYLLIDACEAE IN A CAPE NURSERY

K. C. STANFORD

*Bloem Erf, Stellenbosch,
Cape Province*

With a view to writing some notes on amaryllids for the American Amaryllis Society Year Book, I took a tour round my garden, where only plants indigenous to South Africa are cultivated. I was surprised to find how many members of the Amaryllidaceae are at home there. Then, following up this idea, I took down all the publications to hand on this subject, and my spirits fell for I realised that botanists are right away ahead of the horticulturists. I found many, many species described and sometimes whole genera, of which I knew nothing at all.

I will only write of those that I am actually growing, hoping that the hints given may be of use to those growing them under different conditions.

Just now it is late autumn, *Amaryllis Belladonna*, Herbert which must now be called *Callicore rosea*, is over and its juicy seeds are mostly lying on the ground and the leaves are big and green after the rain; *Nerine filifolia* is just coming into flower, and a great treasure it is. It seems the easiest of all nerines to grow provided that it is never allowed to dry right out. The hair-line leaves are evergreen, it has no dormant season and when it is not flowering it is busy producing new bulbs so that you plant your bulbs one year in a single row and the next year each one is the centre of a group. It makes an excellent cut flower, being a very attractive shade of pink and the stems are delicate.

Nerine filifolia and *N. lucida* (Plate 163) are the only nerines that can be said to flourish in my garden, the latter bloomed marvelously for weeks and the blooms are so large that they suggest *Brunsvigia* rather than *Nerine*. I received it from a collector who found it in quantity near the banks of the Orange River and it has a very wide range. I put it on a raised bed containing plenty of sharp broken up sandstone and good black soil. It was watered occasionally during the summer and the treatment seems to have suited it and it did not even object to our winter rainfall of 50 inches.

Nerine Bowdeni will not flower here; *N. appendiculata* flourishes in a swamp in the National Botanic Gardens, Kirstenbosch, but has at present done nothing for me; *N. flexuosa*, which I raised from seed three and a half years ago, has not flowered yet, and *N. sarniensis*, the gem of all which I planted in a special bed, about 200 bulbs, has also been disappointing. One bulb flowered last year and two this, but a few bulbs left under a bush of Lemon Verbena for six years or so, flower every year. To spite them I have bought *Lycoris* bulbs from America.

Vallota speciosa (*V. purpurea*) is just over now. It may always be relied upon to make a good show, doing best in shade in a well-drained place where it will get water in summer. Grown in a pot it should be left undisturbed until thoroughly potbound.

To understand the cultivation of the different species of *Haemanthus* one must know something of the peculiarities of the climate of South Africa. It is necessary to realize that the species from the Cape can stand any amount of water in winter but must be allowed to dry off in summer. This applies to *H. coccineus* and *H. pubescens*, but species from the northern Cape, Transvaal, Orange Free State and Natal must be kept quite dry in winter, when they are normally dormant. These species include the beautiful *H. Katharinae*, *H. filiformis* and *H. multiflorus* all of which are well worth growing; *H. Katharinae* being one of the showiest of pot plants and, unlike most members of the genus, it blooms while the leaves are in perfect condition. I think that all species of *Haemanthus* prefer a sandy soil and *H. Katharinae* definitely appreciates a mixture of sand and leaf mould and well enriched loam.

Climatic conditions have a similar effect on *Crinum*s, though they are mostly very adaptable. *C. longifolium* likes plenty of rain in winter but can well do with water in summer too. *C. Moorei* is definitely dormant in winter and if kept dry then will give its beautiful pink campanulate blooms in midsummer, and *C. Kirkii* and *C. variabile*, both smaller and daintier than either of these, prefer to be drier in winter. *C. campanulatum* is a very charming species with deep pink pendulous blooms growing in water but it is much happier if the water dries up in winter.

Ammocharis falcata (Hort. in part) is found on the flats a few miles from here but it has never done well in my garden, probably because it insists on a sandy gritty soil, but *A. coranica* blooms well and is very attractive with its sweetly scented ruby-coloured flowers. These two lead us on to *Brunsvigia*. *B. gigantea* makes a grand show every year when it pushes its sturdy candelabrum through the hard soil at the end of summer. Later the large flat leaves appear with the winter rains and they remain until the spring sunshine dries them up and they roll off and no one would guess the presence of the huge bulbs well beneath the surface so well-equipped to stand the baking summer sun.

Tulbaghias should be cultivated more than they are; they ask for very little care and bloom the year round; the bright lavender colour of the flowers is very conspicuous. *Tulbaghia violacea* would be a first-rate cut flower but . . . there is no getting away from the all-pervading



K. C. Stanford, Stellenbosch, South Africa

Nerine lucida Herb.

See page 211

Allium (garlic) scent. However, *T. fragrans* goes one better, its flowers are deliciously fragrant and very nearly as pretty. Every garden should have a good planting of it, particularly as it blooms throughout the winter.

Flowers of the *Cyrtanthus* too are always with us. All winter we have *C. Mackenii* making a sheet of creamy white blossom in a swamp. It grows about a foot high and the flowers have a delicious scent. In early spring *C. O'Brienii* follows with brilliant scarlet blooms and at the same season in sandy soil there is the taller *C. angustifolius*. In mid-summer *C. obliquus* sends up its big umbels of pendulous blooms from some very dry spot on the top of the rock-garden, that is if someone has remembered to give it water in summer. Best of all is the rare form of *C. sanguineus*, known to us as Inanda Lily, from the name of one of its haunts in Natal. It likes hard gritty soil and water in summer.

Hypoxis, which until recently was classified in the *Amaryllidaceae*, includes some of the best-loved of our early spring flowers. Large yellow ones with brown centres are commonly called "Golden Stars," but the most beautiful one is known as *Hypoxis stellata* var. *elegans*, whose flowers are white or a soft pink with a big peacock "eye;" the stems are about 6 inches tall and they like to grow in moist sand. After the rough weather and drenching storms of winter at the Cape, there comes a day when the sun lights the *Leucadendron* bushes on the hill-sides and we take a tour of the garden to see what is happening, and there, in a boggy bit by the stream, the first *Hypoxis* have opened their glistening stars and we know that the pageant of spring has started for us.

CALLICORE ROSEA IN ITS NATIVE HABITAT

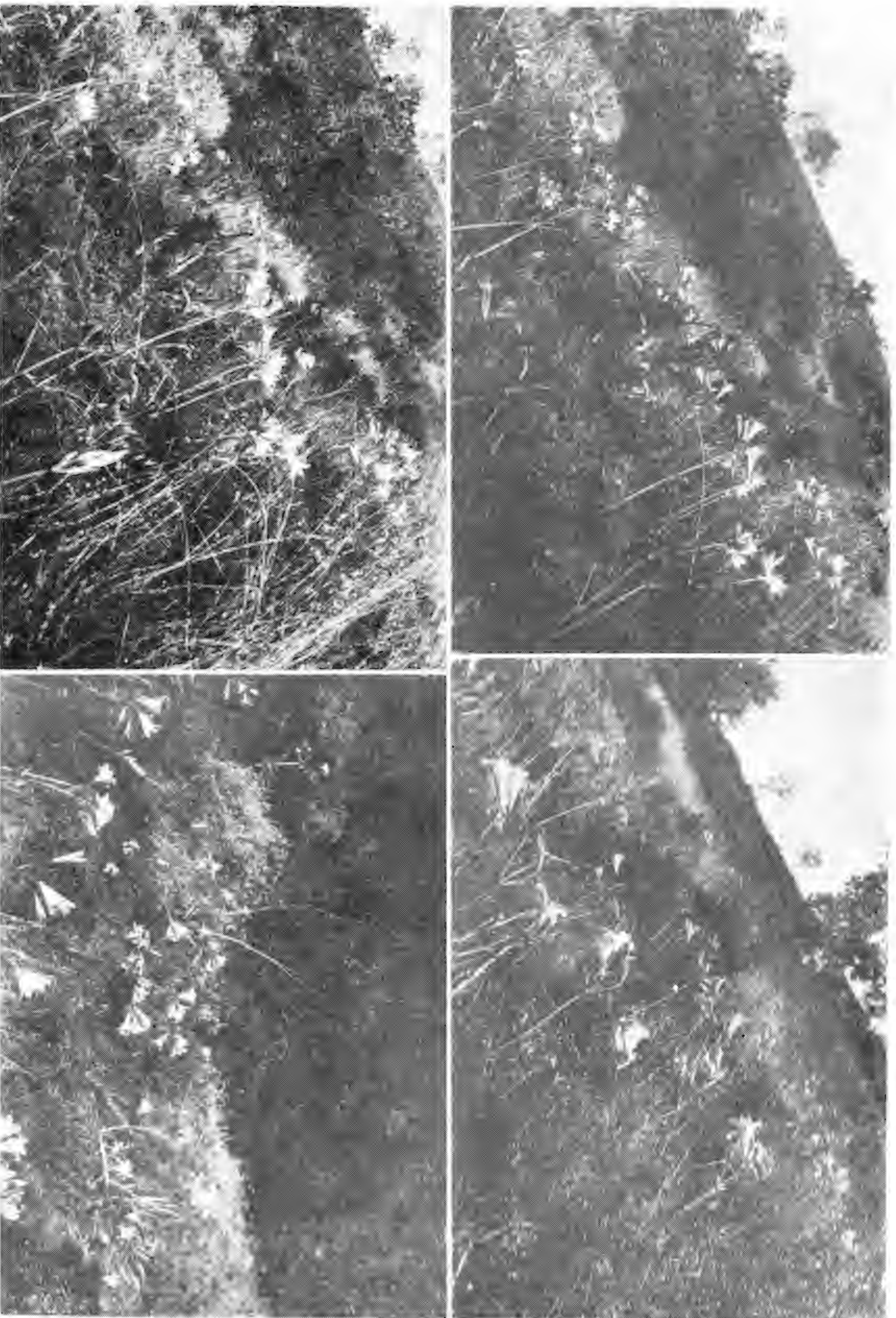
L. B. CREASEY

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The interesting and valuable research of Professor Uphof, the results of which were published in the 1938 number of *Herbertia*, concern a plant whose charms have annually delighted gardeners for well over 200 years.

Callicore rosea, Link, (See Plate 164), for so long grown in gardens under the names of *Amaryllis belladonna* Herbert and "Belladonna Lily," received the Royal Horticultural Society's Award of Garden Merit on April 16th, 1934. No South African plant is more worthy of that distinction. The appreciation of its value as a subject for garden culture has taken it to every quarter of the globe. Although many readers are familiar with the appearance of the species, the following brief description is given for the benefit of those who have not yet made its acquaintance.

The bulb of *C. rosea* may attain to the size of a cricket ball, but is often smaller at flowering size. It is a hard bulb, its papery outer tunic not being so copious and so loose as in many other South African bulbs. Each bulb may bear from five to twelve dark green leaves, each from



L. B. Creasey, Cape Town

Callicore rosea Link, growing naturally on steep slope, spur of Table Mountain,
Cape Province, South Africa.

See page 214

a foot to eighteen inches in length and from half an inch to an inch or more in width. These leaves are thrown up after the flowering season. Having served their purpose they die, after which there is a distinct rest period before flowering.

The flowers number from three to ten (sometimes more), carried in an umbel and on pedicels of from an inch to about two inches long (lengthening to five or six inches in the seed stage), and which arise from the apex of a stout stem of up to two feet or a little more in height. This main stem is oval in section and may be either dull or pale green, while it is frequently tinged dark red or purple. At its junction with the pedicels there are two large, withered spathe-leaves.

The six perianth-segments of each flower are three to four inches in length, about an inch broad, oblong and acute, collectively forming a funnel-shaped bloom, the segments reflexing at their tips. The ground-color of the flower is white, with a hint of yellow at the base of the tube, and streaked pink towards the apices of the perianth-segments. The quantity of this pink stain varies considerably and leads to variation of general flower-color between almost pure white and deep pink. Using the R. H. S. Horticultural Colour Chart, Vol. 1, I find the pink to be generally that of Phlox Pink 625/1.

To complete our description of the flower, the six stamens have white, pink-tipped filaments and the versatile anthers are also white, tinged pink when young, while the style is white at the base and pink toward its tiny dark purple stigma. The globose and membranous capsule splits when ripe to discharge the round, pearl-like seeds, each about a quarter of an inch in diameter.

In the past, several forms of *C. rosea* have been given distinctive names where there have been variations of growth, and of size, color and season of flower. Time of flowering may or may not be a constant character, and color-variations may be partly due to different soils. It would be interesting to check whether color-forms of *C. rosea* are more numerous "in the wild" in any given area than are types of soil and situation. The variations under natural conditions are numerous and the differences are often too slight for taxonomic distinction. Nevertheless, where known varieties have been used for hybridizing, their names and characters are important for the purpose of records.

I can find no information as to the date upon which *Callicore rosea* first reached Europe. It was introduced to England in 1712 from Portugal, where it may have been growing for some years previously.

It is a coincidence and of interest to note that the Portugese were the first Europeans to land in South Africa. After many unsuccessful expeditions covering a period of seventy years by navigators from Portugal, in 1486 or 1487 Bartholomew Diaz landed at the present position of Luderitz, to be followed by Vasco da Gama, who landed at St. Helena Bay (much nearer to the Cape Peninsula) ten years later. The first Englishman to land at the Cape was James Lancaster, in 1591, and he was followed by the first Dutchman in 1595. Thus, although Drake had sighted the Cape of Good Hope in 1580, Table Bay did not provide anchorage for ships until 1591, but I doubt whether any of the South-

western Cape plants could have been introduced to Europe before the colonization of the Cape by Johan van Riebeeck in 1651 for the main purpose of revictualling vessels of the Dutch East India Company.

Callicore rosea has certainly been grown in Europe and America for sufficiently long to become fully established in the milder localities. As an indication of the extent to which it has settled down to the seasonal differences of the northern hemisphere as compared with those of its natural habitat, there is the fact that home-grown bulbs are today available for those who desire to grow this plant.

By no means entirely confined to Table Mountain, *Callicore rosea* is, nevertheless, essentially a plant of the winter rainfall area of the extreme south-western Cape. This is probably one reason why it has proved amenable to culture in the northern hemisphere. Flowers are borne in February, March or April, according to the locality, altitude and season, and the onset of the winter rains see the commencement of leaf-growth—generally in April or May. The dormant season is high summer. Primarily a plant of the mountains, it is as often to be seen in partially shaded kloofs and along river banks as on the more open stretches of the hillsides. Where the ground is very rocky it grows in deep pockets of soil and, although it may be found where the root-run is more shallow, it grows better in a deep soil.

One of the most important facts which we can glean from observation of the natural conditions under which *Callicore rosea* grows, is that, whether in sun or in shade, there is almost invariably a ground-covering of other plants. Thus the base of the stem and the surface soil are usually protected from the full heat of the sun. It is natural that the greater percentage of self-sown seeds germinate and *continue* to flourish in the moister and cooler places where the ground-cover is sufficient to afford protection. The same thing is noticeable in *Agapanthus*. Seeds may germinate anywhere, but the seedlings often die out on bare ground during the hot weather, leaving those in the moister and often more shaded situations to survive and grow.

While flourishing normally amid the cooler surroundings of vegetation and in situations that are not too dry, *C. rosea* will *tolerate* quite arid conditions in South Africa, with the qualification that its season of leaf-growth coincides with that of our winter rains. Last summer I had occasion to visit a very old and neglected garden attached to a building of historic interest in the heart of Cape Town. Above the dry and stony soil several examples of *C. rosea* were flowering on short stems. Elsewhere, I have seen similar instances of this amaryllid growing and flowering (even if not flourishing) in fairly inhospitable places.

Another interesting fact about *C. rosea* is that under natural conditions the bulbs are frequently unharmed by bush and forest fires. There have been many times when bulbs have flowered from ground which had been swept bare by fire only a few weeks or months before, the bulbs usually being sufficiently low in the soil to escape damage. In fact, Rudolph Marloth held that, not only do the bulbs remain barren for many years when thickly overgrown by bushes and trees, but that they flower profusely after a bush fire. Yet, before accepting this as

being due to the removal of surface vegetation, I should want proof that the heating of the soil by fire had not had some physiological effect on the bulbs.

Although *Callicore rosea* grows wild in the Kirstenbosch Nature Reserve which extends up the eastern slopes of Table Mountain (Plate 164), within the garden proper there are both natural and planted areas of this bulb. So much at home is it that in many places one cannot tell which are the bulbs that have been planted. For the seeds do not lend themselves to storage, and may even germinate on the plant. For this reason, only a minimum quantity of seed is collected at Kirstenbosch for immediate disposal. And the species sets seeds so freely that a large proportion fall to the ground and germinate readily in the undergrowth. This, coupled with natural vegetative propagation, has helped the plant to become "naturalized" from former planted bulbs.

I have in mind the Cycad Amphitheatre—a huge semi-circular slope like the inside of a bowl, extending above and around the Fern Dell. In due season the lower portion of this steep declivity is dotted with the flowers of *Callicore rosea*—both as single individuals and as small groups—irregularly littered above the ground, and in all shades from almost pure white to deep pink.

In this area, apart from the Cycads, species of *Podocarpus*, *Virgilia capensis*, and tall tree-like shrubs such as *Kigilaria africana* and *Royene spp.*, there is a light ground-cover of smaller shrubs, ferns, *Asparagus* and, in many parts, tussocky grass that helps to retain the soil during the rainy season. The soil is a deep loam, probably the best in the planted portion of Kirstenbosch and, where grassed, it contains a certain amount of surface fibre. The steepness of the slope results in only about a third of the total natural rainfall (average 57 inches per annum) reaching the bulbs; even so, this is considerably more than the soil would retain were the ground free from vegetation.

Any planting or replanting of *Callicore* that has to be done is carried out after the foliage has died down in November, and they usually miss flowering in the first season, but flower in the second season after planting and can be left undisturbed for several years.

In 1936 the foliage died down later than usual. But, of 150 bulbs lifted from the nursery and planted at about six inches deep on December 18th, some 18 flowered on short stems during the following February. It would have been better for the bulbs had they not made this effort.

Under nursery conditions in full sun the bulbs do quite well, but are happier in a situation where there is a light ground-cover when planted out permanently at Kirstenbosch. The best "stand" of *Callicore* at Kirstenbosch is in a position on which the sun does not shine directly during the heat of the day, but it is possible that the excellent results in this spot may be due to a more generous planting of bulbs many years ago, in addition to the fact that some of the best pink forms are to be seen in that area. Moderate shade certainly results in longer stems, while the flowers remain in good condition for a longer period.

A soil where the natural drainage is good should always be selected for *Callicore rosea*. It need not be a rich soil. A good fibrous loam would be ideal, but if the existing soil is poor it can be suitably improved by incorporating half-decayed leaves. A dressing of bone meal at planting time will be found beneficial and is to be preferred to the use of farmyard manure.

Overseas, *C. rosea* is generally planted in a position fully exposed to the sun. While this may be applicable to countries and localities where the summer sun is feeble, in a warm garden subject to mild winters and hot sun in summer I would rather plant the bulbs on the edge of thin woodland, not too heavily shaded and on a slope where the drainage is good. What a plant will tolerate and what it prefers are two different things. I go so far as to say that while *C. rosea* can be planted effectively in a shrub-border, in a deep pocket on the rock-garden, it is essentially a plant for a position where it can have surroundings such as we describe by the term "wild garden." To mass it in a formal bed or border loses half the beauty of effect which the plant can give in the right situation. Copy wherever possible the careless wisdom of Nature, choosing a sloping piece of ground which already has a light covering of small plants and shrubs, and plant your bulbs in hap-hazard fashion—a few clusters or drifts here and there, with numerous single individuals which look as if they had grown there from self-sown seeds.

I cannot write from experience of the culture of *Callicore rosea* in America, but understand that its seasons of growth and flower approximate to those in England. September and October are the months when it usually flowers in England, the exact time being partly dependent upon the amount of summer rain. One of the most interesting facts regarding the culture of *C. rosea* in England is that there have been occasions (i. e., after wet summers) when the bulbs have not flowered until April. But, even with the normal late summer and autumn flowering, leaf-production occurs at about the most unfortunate time of the year—i. e., January. The foliage, which is so important to the plant in fattening up the bulb for the next season of flowering, may be damaged by frost or by cold winds. Although the bulbs may be planted deeply in order to escape frost, this possibility of damage to the leaves still exists and may account for many failures with the plant. No remedy can be suggested, except the selection if possible of a warm position in the garden. For this reason, some people who do not have a well-drained slope with a southerly aspect, plant *C. rosea* at the base of a wall facing south. We cannot ignore the fact that such positions, however unnatural they may be, are often unavoidable and are justified by the results obtained.

About half-way through the year the leaves may be expected to die down, after which the main period of dormancy occurs for about three months until September. Although bulbs of *Callicore rosea* in the open ground should not be disturbed until they become overcrowded, when lifting is necessary it should be done as soon as possible after the leaves have died down, and re-planting completed immediately or within a few weeks of lifting. If the lifting and re-planting can be finished before the end of July, so much the better.

There are experienced growers of *C. rosea* who maintain that the ground should be soaked twice before the bulbs flower, with an interval of one month between the two applications of water. At the Cape, November, December, January and February are hot and dry. The rains may commence any time between the end of February and the middle of May. While an occasional February rain may occur through thunderstorms or unsettled weather at the stage of transition between summer and winter, as a general rule a soaking *prior* to flowering is rare, except when the flowering season is late. Nevertheless, the object of the grower is to try to improve on Nature's provision for his plants, and under natural conditions there are both good and bad seasons for *C. rosea*. One thing which the bulbs always receive is a thorough ripening, and this is probably the main reason why good results, coupled with a normal season of flowering, are secured overseas after hot and sunny summers.

It is not necessary to set down here a history of hybridizing in which *Callicore rosea* has been a parent. This has already been done by more able hands, and the records are scattered in many publications throughout the world. Suffice to say that *Brunsvigia* and *Crinum* have been the main genera used, and it is of interest to note that all three belong to the tribe *Callicoreae* in the Key given by Dr. Traub in the 1938 *Herbertia*.

While it is noteworthy that *Callicore rosea* has not yet been crossed with any non-African amaryllid, the fact that the plants with which it has been hybridized by man do not grow within its own geographical area of natural distribution is also a matter of interest. The *brunsvigias* and *crinums* are natives of the eastern and north-eastern localities of summer rainfall. Further, those who would believe that *C. rosea* could form natural hybrids with plants growing in close association and flowering at the same season are faced with another peculiarity. For we have *Nerine sarniensis* growing actually *with Callicore rosea* and flowering at the same time of the year. Yet I have neither heard of nor seen a natural hybrid between these two plants. Exactly the same applies to *Haemanthus coccinea*, whose flowering season and locality also coincide with those of *C. rosea*.

Further Notes on Callicore rosea (March 17, 1939). The illustrations, (Plate 164), are from photographs taken by Mr. Creasey on March 12, 1939, and they illustrate the natural conditions under which this plant thrives. Mr. Creasey writes that—

“The bulbs were growing at the edge of the municipal fire-belt which borders a path round Lions Head, which is a spur of Table Mountain. They were on a steep slope facing south and west, at the edge of the belt nearest to the thick scrub of natural vegetation, and even penetrating this in one or two instances. The fire-belt itself has been cleared of all trees except the Silver Tree (*Leucodendron argenteum*), but it is *not* bare ground. As the photographs show, there is a ground-cover consisting mainly of grass. Although most of the flowers are in full

daylight, the plants are screened at the base of their stems. An interesting fact is that *all* the flowers turned away from the direct rays of the morning sun and faced the scrub—and beyond, the sea far below. Not until about 3 p. m. would the flowers have the sinking sun directly on their open faces.

“In this one patch the flowers were of all colors from almost pure white to deep pink. One specimen had not even the usual pink tinge at the apices of the segments. It was definitely white, with the faintest possible suffusion of pink over the petal surface, on the upper portion of the filaments and at the apex of the style. The pink only became prominent in the dying flower. The base of the flower was lemon, distinctly so when young. In some of the pink forms, the pink gradually spread down the whole of the petals with age, but this does not seem to be a constant feature. Although all color-forms—or at least *many* color-forms—are growing in that one area, this does not remove the possibility of the soil and situation of individual bulbs being partly responsible for color-variation, since natural increase is mainly by seeds and time can to some extent fix a variation and carry it from its source in the form of seeds.

“For the past fortnight large quantities of *C. rosea* have been sold as cut-flowers by the coloured flower-sellers in Cape Town. Sometimes these are from flower farms near Cape Town, but annually the bulk is still collected “in the wild” in defiance of Government restrictions on flower picking. On March 4th, I saw huge quantities on sale. These would be from the lower elevations because at that time there were few, if any, on the mountains this year. The paler pink forms were one dozen stems for sixpence (12 cents). Very deep pink forms were four stems for ninepence (18 cents). One form was pure white except for a touch of pink at the tip of each segment. Another was so deep a pink as to show very little white, the pink suffusion spreading right down the flower into the yellow base.”

CALLICORE ROSEA AND BRUNSDONNAS

E. O. ORPET, *California*

The Belladonna Lily, *Callicore rosea*, (*syn. Amaryllis belladonna* Herbert) is one of the commonest bulbs seen in its season and always in the pink form, and must have been introduced here long ago (Plate 165). We are told by Miss Kate Stanford of South Africa that with them this same species is rarely seen in the pink form but is usually white or pale pink; so there must be variation within the species. When the first white-flowering *Brunsdonna multiflora alba*, a hybrid between *Callicore* and *Brunsvigia*, was brought into California, at least twenty-five years ago, it was highly valued and was used considerably for cross-pollination. The resulting bulbs have been lost sight of since the death of Mrs. Bullard, and we have been unable to trace these, but I saw them in her garden before they were old enough to flower. When after gaining possession of one of these original bulbs imported from Australia—the

one they list there as *Amaryllis multiflora alba*—(=*Brunsdonna multiflora alba*)—and seeing it flower, with tall stout stems bearing twenty to thirty pure white flowers with a golden base to the throat, the urge came to get more. This was done, and we also added *Brunsdonna Hathor*, the one shown in the foreground of the illustration (Plate 165); also *Brunsdonna Harbord* which with several other white ones we have not yet flowered. The one named *Amaryllis belladonna rosea* (=*Callicore rosea*) is a great beauty, equally tall and free flowering and greatly surpassing the old type in color and vigor but still rose-pink. All of the bulbs were in flower during August and September; the flowering of each bulb lasting several weeks.

It was always a mystery how the Australians got the breaks to produce such fine variants until we read the detailed story by G. H. Cowlshaw of Sydney, Australia, in *Herbertia*, Vol. 2, pp. 43-51, 1934. In this article is given a detailed list of the hybridizers back to 1870, and an account of their free use of *Brunsvigia* with the *Callicore rosea* (syn. *Amaryllis belladonna* Herbert). This was most enlightening and shows what was being done so long ago in far-off Australia. Mr. Cowlshaw states that these white hybrids do not come true when selfed, but vary to one or the other of the parents used. We see this here in that many of their offspring are dwarfer in growth than others, but none has flowered here yet.

There is a little difficulty with imported bulbs owing to the change of seasons which has to be adjusted as the two rest periods come together. The difficulty is overcome by giving little water to the rootless bulbs until growth begins.

The culture of the Brunsdonnas is of the easiest here—open ground, hot dry, rest period in the summer with little water, until the rains begin in autumn. The natural increase amounts to about doubling in number, each bulb producing an offset when well established. We have tried cutting at base of the bulbs, but these are different from most, having a fibrous coat between each layer, and we have failed to get increase by this method. Seeds are produced freely by self-pollination and these germinate well, but I am not sure at present how long they take to reach flowering age.

To those interested in breeding amaryllis, I would urge the re-reading of the article by Mr. Cowlshaw just referred to, as many genera are mentioned and the work of many experimenters is chronicled. I have had occasion to refer to it many times. Results secured by the breeder of *Callicore rosea* are not as rapid as in the case of *Amaryllis* (syn. *Hippeastrum* Herbert) and perhaps the field is limited for their outdoor culture, but where severe frost does not occur for extended periods, success may be expected, although the common species should be tried first before the beautiful white varieties of *Brunsdonna* are planted. With established bulbs, one can see and estimate the possibility of increase by offshoots. It is best to lift and separate when signs of growth are still visible, preferably after the flowering period.



E. O. Orpet

See page 222

Callicore rosea hybrids, upper; *Brunsdonna, Hathor* in foreground,
Multiflora Alba in background, lower.

CALLICORE ROSEA FOR THE MIDDLE ATLANTIC STATES
AND THE SOUTHTHOMAS FINLEY MARTIN, *North Carolina*

Why *Callicore rosea* Link should be so ignored is one of the interesting sidelights on the mind of the discriminating bulb conscious amateur. That this interesting and beautiful amaryllid is ignored by amateur and professional alike here in the East is a fact is evidenced by the rarity with which one ever sees it grown or offered in the trade.

There are reports of growing this bulb with success outside in New England. It should be comparatively easy therefore in any of the Middle Atlantic States, and a matter of "daffodil ease" in the South. The secret of growing and flowering it over a period of years outside seems to be in a very simple cultural requirement. One should plant the bulbs fairly deep in a moderately rich sandy loam in a position on a south side of a wall or other protection. Then leave the bulb alone until there are so many offsets as to make moving imperative. If the soil about the bulbs can be kept fairly dry during the winter this will be an added help. Those who are more venturesome in their gardening might try variations of this to add to the general knowledge of amaryllid culture. *Callicore rosea* comes from the Cape Country of South Africa and for that reason many persons have probably gotten the notion that it is a plant requiring a long dry resting stage.

In California one finds this beautiful plant flowering in great numbers. It is so common there in fact that the excess bulbs are passed on from one garden to another very much as the usual gardener trades superfluous iris rhizomes. During September and October while driving along the streets it is not uncommon to see masses of this amaryllid in full bloom. The date for flowering would probably be a bit earlier in the east.

For years the writer had read of *Callicore rosea* Link (syn. *Amaryllis belladonna* Herb.) and had wondered about it. Circumstances had made it impractical to attempt to grow any of the bulbs. Then on a recent trip to the West Coast the sight of large quantities of it growing and blooming in great masses created a fitting climax to all the years of waiting to see it. The flowers are very similar in general appearance to the ever popular *Lycoris squamigera*. The color is a clear pink, in contrast to the bluish lavender of the *Lycoris*. There are numerous horticultural forms that vary in color from white to red. The normal form, pink, is the one most commonly found. The rapidity with which the bulbs multiply in California would seem to indicate that the price will not continue to be prohibitive for the average gardener.

I would like to say that I believe the criterion of a real gardener is his willingness to dare make an investment in a plant, upon no other recommendation than its Latin name and description, regardless of the fact that he might entertain considerable doubt as to his ultimate success with it. The sheer adventure of embarking upon a gamble with an unknown plant in the hope of winning the abundant reward of flower-

ing something new is in itself a thrill, that should preface and augment the joy of achievement that comes to the person who has the diligence and persistence of the dyed-in-the-wool horticulturist. One could name offhand a score of good bets in such a gamble of which *Callicore rosea* is only one.

AMMOCHARIS FALCATA

JOHN MARTLEY

Banhoek, Stellenbosch, South Africa

Although *Ammocharis falcata* is not such a showy flower as *Callicore rosea*, the Belladonna Lily, it has sufficient merits of its own to attract attention. It is widely distributed in South Africa but my personal encounters with it in the veld are limited to about half a dozen localities, all flat low-lying ground, within forty miles of Cape Town.

Like many other native bulbs they are never to be found in the veld unless you happen to stumble on them when in flower. A good illustration of this fact is my discovery of a charming little pink *Ixia* (a new species which has been named *Ixia cochlearis*). During the last ten years I have tramped backwards and forwards over the veld close to my place and I fondly imagined that I knew every plant there but to my surprise one day last December a patch of ground about 20 by 40 yards and only 50 yards from my gate was just one mass of a new little pink *Ixia* with the habit of a *Tritonia*. A thing like this recalls to one's mind that old and obsolete theory of spontaneous generation!

Ammocharis falcata is not particular in its requirements. You find it growing in the most unpromising soils; its favourite appears to be that hard gravelly clay sort much favoured by road contractors for surfacing our country roads. The illustration (Fig. 43) shows it growing in such a soil in the rough of the Stellenbosch golf course. In this case the over-all height is hardly 9 inches but in the very light sandy soil of the Cape Flats I have found it up to 2 feet in height with the inflorescence approaching 3 feet in diameter with some 40 or more flowers. There is no doubt that it is a tough sort of customer that can take the rough with the smooth of life. I know of a country road which had been graded over a patch of ground in which a colony of these bulbs lived, and year after year you would see them pushing their way up through the surface of the road. Not so many years ago an energetic divisional council decided to "tar-mac" many of its country roads including this particular one. Was our *Ammocharis* defeated or down-hearted? Not a bit of it, for to my surprise last autumn what should I see but its distinctive double-ranked sickle-shaped leaves pushing up through the thick coating of tarred-chips. In time no doubt these bulbs will give up the unequal struggle against tar-mac and hurrying motor wheels but in the meantime they are still holding out.

My first contact with *Ammocharis falcata* was meeting with a strange porcupine-like ball of spikes some two foot in diameter bowling along before the wind over the Cape Flats one windy day in autumn.

When the seeds are ripe the peduncle breaks off and as the wind blows the dried-up inflorescence about the seed capsules get broken and sow their contents broadcast over the veld. The seeds are rather large but somewhat variable in size and like *Nerine* seeds they start to germinate very soon after they are ripe.



Fig 43. *Ammocharis falcata*.

I do not know how long seedlings take to reach maturity as much of course depends on the sort of ground the seeds happen on, but from the rate of growth of the young bulbs which I raised from the seeds of that wandering inflorescence described above I should think that one could hardly expect a flower under eight or ten years. Mature bulbs are about fifteen inches in girth and approximately spherical in shape. In the ground the base of the bulbs is about six inches below the surface of the soil. Although this is not deep it is a surprisingly difficult job to dig out a mature bulb without damage owing to the hardness of the ground and the tough hold of the strong root system.

The time of flowering is in the autumn and the flowering stem appears before the leaves. As the seeds ripen the leaves appear with their characteristic double-ranked arrangement and more or less closely adpressed to the ground. They reach their full development during the winter season which is the period of vegetative growth. As the summer



Mrs. J. W. Archbell, Umkomaas, Natal

See page 228

Tulbaghia violacea

comes on the leaves die away and the bulb enters a resting period lasting till the following autumn. There is nothing outstanding in the colouring of the flower which consists of a pinkish shading on a more or less white background. On the reverse side there is a dark brownish-pink mid-rib to each segment and the anthers are yellow. The flowers are scented but more pleasantly so than *Callicore rosea* since for me the scent of the latter is a bit too overpowering.

As all my own bulbs are small I am not able to say if *Ammocharis falcata* is a free-flowerer. Judging however from the number of inflorescences in the groups in the veld I doubt if mature bulbs flower every year in the wild state. Under the more opulent conditions of garden life there would be more likelihood of them blossoming forth every year.

Yes, in spite of possessing no very outstanding qualifications *Ammocharis falcata* is quite capable of establishing itself in horticultural society on the merits of its own self.

TULBAGHIA CULTURE

MRS. J. W. ARCHBELL

Natal, Union of South Africa

The fascinating member of the *Amaryllidaceae*, *Tulbaghia*, is indigenous in the Cape Province, but grows well in many parts of Africa. I have read of it growing and flowering almost continuously throughout the year as far north as Kenya, and no doubt it would flourish as well in the United States of America. There are two species under cultivation and these will be briefly described—

Tulbaghia violacea is charming (Plate 166); it has narrow strap-shaped leaves, and produces an umbel of eight to twenty clear mauve flowers on a thin strong upright stem that reaches from nine to twelve inches in height or it may be even taller. The only defect is the strong garlic smell. It is extremely hardy and does well in moist low positions in my garden, but also grows on a dry stony hillside among my aloes and succulents. It seems to be free from insect pests that are so numerous and destructive to most South African amaryllids. Possibly the strong onion flavor and smell give the protection.

Tulbaghia fragrans (syn. *T. alba*) has dainty, creamy white flowers, and blooms in spring only. It has a very sweet perfume. Possibly the recurrent blooming habit of *T. violacea* could be secured in combination with the sweet perfume of *T. fragrans* (minus the garlic smell) by making appropriate crosses. This should surely be worth a trial.

AMARYLLIS PROCERA AND GARFIELDII HYBRIDS

FRANK VASKU, *Florida*

Amaryllis procera has not been happy so far in Florida probably due to errors in culture. They were placed in soil strong with rotted manure and limestone and wood ashes. In this medium the bulbs began to retrograde. One put out a bloom stalk but it blasted before it opened.

Gradually they were changed to muck with some sand mixed in and they are beginning to respond. From appearances it will be some time before we can hope for bloom.

In July 1937 I received a small bulb of *Garfieldii* hybrid *Amaryllis*. If there was a number on it it got lost. It was put into a 6' pot and began growing like a weed. In a year's time it had filled the pot with offsets so that it was transferred into an 8' pot and by this spring this pot too was as full as it could be with the bulb and offsets. Last March the bulb had attained about 3' size and sent up a two foot spike with four large bells. The flowers were somewhat drooping, of red color with an orange cast to it and a yellowish throat. Before this spike was finished another one was coming up which proved every bit as good as the first. The flowers were almost 8' across. When it got through blooming 60 offsets were taken from the original bulb. *Truly a wonderful plant.*

At this writing, May 31st, another *Garfieldii* hybrid is open, No. 56. It came during the summer of 1938. It has only six offsets, measures about 2 inches or less; has 15' stalk with 3 bells, the first of which has just opened today. The flower has an upturned face; orange red in color with a yellow throat (reginae type)—a pretty flower but not in the same class with the one described above.

HEMEROCALLIS IN CALIFORNIA

FRANK A. LEACH, *California*

Although admirably suited to the existing conditions of most California gardens, *Hemorcallis* are rarely seen in our representative gardens. It undoubtedly suffers from the public's aversion to such technical names and also from the implied slander in its unfortunate popular name "Daylily." Although it has been standby in many gardens since the early days in California, I do not remember having seen it offered for sale until quite recently, and then only by a few nurseries. I regret to say that in these, the blocks of plants offered for sale did not seem to have diminished during the past selling season in spite of the fact that standard varieties were offered at reasonable prices.

The California State Federation of Garden Clubs has featured day-lilies in its magazine recently, and other publications are now giving much attention to the new introductions so that it may not be long before daylilies in variety will find their way into our gardens.

A planting of some twenty standard varieties blooming for the first time in my garden this year has attracted much attention and caused much favorable comment. All of which has disclosed woeful ignorance on the part of the public concerning this fine garden perennial. One large clump of *Fulva Europa* growing under the edge of my old apple tree was a glory of sunset hues for a full month. What more could be asked? *Apricot* opened the '38 season with the first bloom on April 20th, followed by *Gold Dust* and a dwarf form of *H. flava* before May Day. *Orangeman* bloomed on the first and *Winsome* on the 24th of May. During June *Amaryllis*, *Mikado*, *J. R. Mann*, *Cressida*, *Hyperion*, *Ophir*,

Margaret Perry, *Fulva Maculata*, and *Anna Betscher* made a fine display. In July, *George Yeld* and *Golden Dream* held the stage while the June bloomers still produced many flowers. The old double *Kwanso* finished the procession for 1938 since several that should have bloomed later did not produce flowers for the first season after planting.

In Central California, especially inland from the Ocean, most varieties are practically deciduous. In Southern California and near the Ocean in the warmer locations, it is advantageous to choose many of the evergreen varieties for their foliage is a distinct asset in the winter garden. In the great central valleys there are times when plants must stand 10 to 15 degrees of frost in the full sunlight, without snow covering, alternating with mild, damp growing weather. These are very trying conditions for any perennial, but daylilies thrive with us.

Burbank worked with daylilies in his earlier days at Santa Rosa. Although seedlings were sold from his nursery, Carl Purdy is authority for the statement that *Calypso* was the only clone introduced commercially from Burbank's endeavors. Although Purdy has sold a variety under the name *Burbank* that he obtained from this grower, the variety does not now exist in commercial quantity. There is in my planting a dwarf growing form of the Lemon Lily which is attributed to Burbank. His greatness lay in his ability to observe such variations and to recognize their value. However, all the romance of his name has not served to popularize daylilies in California.

MILLA BIFLORA

W. M. JAMES, *California*

Since discussing *Milla biflora* in the 1936 Herbertia, I have had reports of it growing nicely in many sections of the United States (Fig. 44). This indicates that the methods of culture and propagation suggested were approximately correct. Seed germinates readily in two to four weeks when planted one-fourth to one-half inch deep in the open ground after danger of frost is over. A few corms may bloom the second year. Most of them do not bloom until the third year, and I have found that they do very well if left in the ground until then. Although the growing plants are tender, dormant plants will probably stand several degrees of frost, especially if the ground is well mulched.

It is absolutely essential to store the corms in shallow trays in a dry place. That cannot be emphasized too strongly because they are especially susceptible to *Penicillium* (lemon mold) and *Rhizopus* (bread mold). The corms should be dried as soon as possible after digging. I have found no better method than that described in the 1936 Herbertia. Small cormlets should not be removed from the mother corm unless they break off very easily. Neither should the old dry corm be removed from the bottom of the new corm unless it comes off very easily. These watery scars and any bruises or scratches made while handling the corms make an ideal place for the mold spores to germinate. I have tried several fungicides, but none proved very satisfactory.

Milla biflora is proving a very easy plant to grow and I enjoy the flowers now just as much as when my first corms bloomed about eight years ago.



Fig 44. *Milla biflora*

HOUSE CULTURE OF AMARYLLIS

JOHN F. RUCKMAN, *Pennsylvania*

No house plant will give greater returns for the initial cost and subsequent care than hybrid amaryllis. Yet they are not very commonly grown and there is considerable complaint about their failure to flower. They do not thrive on neglect nor do they take the fussing that such forcing bulbs as tulips, hyacinths, freesias and most narcissus do. There are several easily avoided causes for most failures with them—improper potting, careless watering, neglect after blooming and general impatience.

Dormant bulbs should be bought and potted up in November or December though fair success is possible with bulbs potted as late as March. For the beginner perhaps it is just as well to start with the thirty-five or fifty cent bulbs offered in mixture by most seed houses. Once you get the knack of growing them by all means get the higher priced specified colors or if you can find and afford them, named varieties.

For potting soil use two parts of good loam, one scant part of dry pulverized poultry or sheep manure, one part sharp sand and a little bone meal or horn shavings. If cow manure is more convenient it may be used in a little larger proportion. Some discretion is also necessary in the amount of sand used according to the nature of the loam. There should be just enough sand to make the soil loose and friable. As a general rule the diameter of the pot should be one inch greater than the diameter of the bulb. Most of my amaryllis have flourished and bloomed freely for a number of years in four to six inch pots; a few very large old bulbs are in seven inch pots but I have found it best to keep the pot size at an absolute minimum. There are two reasons for this, small pots are much more convenient to handle and place in the average house and no house-grown amaryllis blooms its best until it is thoroughly pot bound. It is the usual practice to put an inch of sand or broken crocks in the bottom of each pot for drainage. I do not do this preferring to use that space for soil and thus keep down the pot size. However this entails much greater care in watering.

The bulb should be set so it is from half to two thirds above the soil in the pot with the level of the soil a half inch or so below the rim of the pot to allow for watering; potted deeper than this damage from over watering is much more apt to occur. It should be given one good watering and set in a warm, light though not necessarily sunny place and watered very cautiously until leaves or a bud appears. After that water every day but still cautiously and never under any circumstances so heavily that water will stand in the saucer under the pot for more than an hour after watering.

After blooming as vigorous a growth as possible should be encouraged and as soon as danger of frost is past the pots should be plunged to their rims in the soil out doors in a spot where they will get at least half a day of sun light and are sheltered from high winds. It is well to put a small flat stone or piece of tin under the drainage hole of each pot to prevent the roots from striking down into the soil. Before frost in the fall they should be brought inside, preferably to a window sill in an unheated but frost proof outbuilding or cellar where they may remain, watered just enough to keep from wilting, until freezing weather sets in. Many amaryllis will have a second crop of bloom during the summer and a few may bloom three or even four times a year. As a general thing when buds appear in summer it is just as well to bring the plant inside while it is in bloom to prevent storm and insect damage. Some hybrid amaryllis are naturally deciduous and some naturally evergreen. I think it is best to let each bulb follow its own inclination in this. Those bulbs whose foliage turns yel-

low and dries off after lifting in the fall should be put in a warm cellar and watered hardly at all until signs of renewed growth appear, usually some time in December. Those that retain their foliage should be kept in a warm, light place and watered just enough to prevent wilting until buds or new leaves appear. At the first sign of renewed growth they should be set in the warmest, sunniest window available where they should remain until they go outside for the summer.

Amaryllis resent having their roots disturbed and should not be repotted any oftener than absolutely necessary. Late in the fall when they are dormant or most nearly so I knock them from their pots and crumble off as much of the old surface soil as possible without disturbing the roots. In a healthy bulb the lower part of the ball of roots will be so dense that no soil can be crumbled off. Put half an inch of new soil in the bottom of the pot and return each bulb to the same pot it was in before, tamping fresh soil between the root ball and the sides of the pot and lightly covering any roots that may be exposed on the surface. Thus the bulbs are raised a little in the pots each year but the roots are not disturbed and the pot size is not increased until after three or four years or even more it is impossible to get them back into the same pot and a slightly larger one must be used. Some bulbs are eventually literally sitting on top of the soil with only their roots buried but continue to bloom as freely as ever. More drastic treatment or disturbance of the main ball of roots is only advisable when there seem to be a large number of old dead roots which need removing, which should not be oftener than once in four or five years. It is just as well to remove the old dry outer scales from the upper part of the bulb from time to time. They are untidy looking and make a harbor for thrips, the only really serious amaryllis pest I have encountered. Thrips flourish indoors and can pretty thoroughly ruin an amaryllis if not promptly discouraged. They can be eliminated by weekly sprayings with Black Leaf 40, one half teaspoonful to a quart of soapy water as hot as you can hold your hand in. It usually takes a course of about eight very thorough sprayings to do it however.

Amaryllis are heavy feeders and although a newly potted bulb needs no extra feeding for the first six months or so established bulbs, especially when grown in small pots, do much better for constant rather heavy feeding. As soon as the buds appear I give weekly waterings with manure water diluted to the color of weak tea until the buds show color; from then until the blossoms fade it is withheld. When the blossoms have faded I resume the weekly feedings, usually with manure water but occasionally with commercial general purpose fertilizer until the bulbs are set out for the summer, then every ten days or so through the summer. No feeding is necessary or advisable from the time the bulbs are lifted in the fall until new growth starts again.

When amaryllis are grown in the house it is necessary to turn the pots halfway around every week or ten days so that first one side then the other of the plant will get the sun. Otherwise the foliage gets to leaning toward the light and is apt to get so lopsided it is no longer able to support itself and flops about in an untidy manner. From the time

the buds are about four inches high until the bloom is faded the plants should be turned every day. Amaryllis buds have a very strong heliotropism and develop so rapidly that a bud will grow so crooked if left unturned two or three days in bright weather that it has to be staked to be straightened. Turned daily, the buds grow straight up and never need staking.

Amaryllis almost always bloom the year they are planted but very often fail to bloom the following year. They have put so much strength into forcing that first season's bloom without roots then into growing an entire new root system that only a very vigorous bulb or one growing under the most favorable conditions can also form buds for the next season's bloom. A great many people not realizing this lose patience and give up trying to grow amaryllis. This is a great pity for they almost invariably bloom the third year and there is no comparison between the forced bloom on an unrooted bulb and the bloom on the same bulb when rooted. As an example, two years ago I bought a bulb of a highly recommended named variety. It bloomed promptly enough but the quality of the bloom was rather disappointing. The blossoms which were supposed to be extra large were smaller than those on most of my run-of-the-mill bulbs and the color was fady. Last year, as is so often the case, it did not bloom but this year it even surpassed its originator's description—the blossoms were half an inch larger than specified and the color was superb.

These methods, of course are entirely for handling a few bulbs for household use in the north. Greenhouse culture or culture in pots farther south where the outdoor growing season is longer would doubtless be quite different. Probably most bulbs would do well enough with less feeding but I have found that extra feeding is more than paid for in quantity and quality of bloom; such drastic root crowding may not be necessary, however I have seen more amaryllis that have failed to bloom because they were over potted than for any one other cause. That all but two of my twenty-four hybrid amaryllis have bloomed so far (February 10) this winter with two to eight blooms to a bulb and many of them also had bloomed last summer makes me feel that this method cannot be far wrong.

AMARYLLIS CULTURE IN MANITOBA

R. W. KENNEY, *Manitoba, Canada*

Is there any basis for this statement,—“If the plant is not pot bound, the bloom will be at the expense of the bulb?” (Heaton, 1st Vol. of *Herbertia*). Does rest or ripening or these other terms used commonly to excuse the abuse of the amaryllis for the commercial convenience of the grower under glass, really mean what they say?

One is used to the expression ripening of wood in relation to shrubs. One thins out the growth to the main stems and as a result the following crop either of blossom or fruit or both is increased. We are told by com-

mercial growers that this thinning out allows the air and sun to ripen the wood. What really happens is we have decreased the load on the same amount of root growth so we increase the crop.

Now the drying off of the amaryllis bulb gets it under the bench, and so allows room for another crop to be grown under the same glass and thus overhead is cut down, the turnover is increased.

But what happens to our bulb. We have bloomed it, and we have a shrinkage in the bulb of one half to one third in bulk. How will this be replaced? If not replaced no bloom will result the next season. Mr. Diener says that his bulbs do not require drying off, they may bloom at any time, that is more than once a year. Have these two statements any relation? I am inclined to think they have.

We find that the iris rhizome that makes side rootlets from the main roots will bloom the following Spring and the one that fails to do this does not bloom. Those who have sunken potted amaryllis bulbs will have seen roots growing over the rim of the sunken pot and that these escaped roots have lateral rootlets and a mass of them. The plants that do this are invariably in splendid health and are sure bloomers the following Spring.

So again one is forced to the simple conclusion that the better the root growth the better will be the resulting bloom crop. The bulb may stand the abuse of ripening, drying off and under potting, but instead of these being cultural beatitudes they are abuses of a very fine tolerant bulb.

The Bureau of Plant Industry at Washington has advocated seven and eight inch pots. Their results speak for themselves. Barrs in London say that with moist bottom heat they get a good growth of green straps with their bloom. After the growth is well started the bottom heat is discontinued. My own experience is that if moderate watering is continued instead of drying off there is usually a leaf growth that keeps pace with the growth of the bloom scape.

One other thing should be done to attain a lusty bulb. Repotting after the bloom scapes have withered. It is at this time replacement of the loss of substance will take place and hence the renewed food supply. This is becoming general practice as the amaryllis is better understood. It is however not new, as an old bulb book by Fish strongly advocates this.

The Bureau of Plant Industry at Washington in its bulletin on offsets says that the offset should be separated by disentangling the roots from the bulb roots. This is done each year as a healthy bulb usually makes one or two offsets. This would mean repotting of the old bulb each year. But in the bulletin on culture of the bulb, repotting is advocated at intervals of five years only.

DAFFODIL NOTES: VARIETIES, MECHANIZATION OF BULB INDUSTRY, AND BORON IN BULB NUTRITION

JAN DE GRAAFF, *Oregon*

It is almost impossible to attempt to give a coherent report on activities in the daffodil world during 1938 and 1939. Both in this country

as well as abroad, the number of shows is still increasing. So many new varieties are being shown that my correspondents in England and Holland say it is impossible to make a critical appraisal of them. The special show reporters for such trade papers as the Dutch "Bulb Growers Weekly" and the English "Horticultural Advertiser" also mention in their reviews that the number of novelties shown is such that it confuses even the expert. Obviously the task of selecting good varieties for the American gardening public devolves on the American growers and they have not taken this responsibility lightly.

A visit to the major bulb fields on the Pacific Coast during flowering time convinced me that the growers here are well aware of the opportunities that they can find in the selection and propagation of new varieties. It must be remembered that in most gardens the daffodils are neglected for the largest part of the season. They often have to compete with a rank growth of weeds or with annuals planted over them. Obviously only the strongest and more prolific varieties will survive this treatment. Another consideration for growers in this country is that as yet the demand for high priced novelties is very limited. Distributors prefer to keep varieties listed over a period of years and are not apt to make many changes. With this in mind, it is quite understandable that a variety like *King Alfred*, now in its fortieth year, is still by far the most popular flower at all shows in this country. *Fortune*, some twenty years old, is beginning to gain recognition with others than the few advanced amateurs who have already grown it for several years. *Beersheba* and *Aerolite*, both some fifteen years old, are now listed in most catalogs and have gained recognition at all shows. It is plain that many years must elapse before we know if a variety has sufficient stamina to be universally popular. It should be sturdy, a rapid grower, and plant and flower should both have good proportions. For the varieties with colored cups it is very important that they retain their color even in the full sun. All daffodil breeders have put great emphasis on perfect form, yet the public reaction to some of the more informally shaped flowers has been very favorable. I believe that in this direction some very good work could be done. Hybridizers should remember that while a perfect saucer-shaped and flat perianth may to them be a sign of great refinement, the public like flowers of more loose conformation which can be used to better advantage in flower arrangements. The great popularity of *Triandrus* hybrid *Thalia* and of *Incomparabilis John Evelyn* prove my contention. Other flowers that have a pleasing informality are *Delaware*, a new Leedsii type brought out by our firm, and *Florida*, a giant *Incomparabilis* of very good coloring and huge size.

The mechanization of the daffodil industry on the Pacific Coast is progressing. New machines to harvest the bulbs are being perfected and already we have on our farms one which harvests three acres of daffodils during a day of nine hours and puts them free from soil into trays. Other machines are now available which will plant the bulbs at a rate of one and a half acres per day, and together with the motorized cultivators these machines make mass production of bulbs possible at very low cost. I do not doubt that the same methods could be used for the



Harry L. Stinson

Bomarea caldasiana

See page 238

Plate 167

mass production of amaryllids and will be an essential factor in the popularization of these plants.

Workers at the North Carolina Experiment Station and the Federal Department of Agriculture have recently reported on the result of two years' work with boron. They have found that three pounds of the material mixed with commercial fertilizer and applied at the rate of 1000 pounds per acre increased the blooming of daffodils from 10 to 25%. Experiments conducted during the first year showed that an acre of bulbs that averaged 56,000 blooms without boron, gave 65,000 blossoms when the three pounds of boron were added to the soil. The same bulbs were replanted the second year and gave 70,000 blooms on boron-treated soil and only 56,000 on untreated soil.

BOMAREA CALDASIANA

HARRY L. STINSON, *Washington*

Bomarea caldasiana (Plate 167) has been under cultivation so short a time that very little is known about its requirements. Some three years ago five plants were brought up from San Jose, California and placed in a cool greenhouse. At first they were placed in full sun, but they quickly showed that they did not like their location. After some puzzling over them for a while it dawned upon me that their climbing and trailing tendency gave a hint as to their culture. So the pots (6 inch) were placed so that they were in constant shade and cool, and the vines were allowed to climb up over the other plants or were tied up nearer the glass. The vines seem to stand considerable direct sun without injury.

During the winter months, October to February, they are given less water and they enter a semi-dormant stage, no growth is made and they stay evergreen. With the coming of spring they start into more active growth and during May and June they burst into bloom. The flowers are borne in terminal clusters of eight to ten tubular flowers. On the outside they are orange-red, and yellow on the inside of the petals, dotted with maroon dots. They stand up quite well as a cut flower. Ordinary rich soil was used in potting.

To date the writer has eight species of *Bomarea* as seedlings under observation.

(Amaryllis Hybrids—Lancaster; continued from page 205)

ALIPUR BEAUTY: (*A. stylosa* x *A. reticulata striatifolia*, Mrs. Garfield); foliage dark green, stripe down centre of leaf narrow and white, length 15 inches, width 2 inches; flower spike 15 inches high, four-flowered, individual flower four inches in diameter, petals $1\frac{1}{4}$ inches wide, colour deep carmine pink slightly lined, the base of the tube pale green, each petal with a distinct white band, those of the central and two outer petals extending to the tips but the inner two reaching half way, filaments pink and pollen cream. The back of the petals very much darker pink, and the tube short.

7. HARVESTING, STORAGE AND FORCING

DAFFODIL FORCING DEMONSTRATIONS IN HOLLAND

JAN DE GRAAFF, *Oregon*

An interesting demonstration of the effect of special treatment of daffodils was made by Dr. Volkersz, who is in charge of the Government Horticultural School at Lisse, Holland. On November 28th, (1938), he showed a group of pots of *Narcissus incomparabilis Helios*. The bulbs had been lifted on July 23rd. On arrival at the school (July 26th) the bulbs were divided into three lots. The first of these was first stored for six days at a temperature of 95 degrees and then at 48 degrees. By the middle of September the foliage was up about two inches and the bulbs were planted in the greenhouse which was kept at from 63 to 68 degrees. The second lot was also given the six days of 93 degrees, but after that the bulbs were immediately potted and kept in storage until the foliage was up some three inches after which the pots were brought into the greenhouse which was kept at 68 degrees. The third lot was given a storage temperature of 48 degrees and kept at this temperature until the bulbs were brought into the greenhouse which also was kept at 68 degrees. On November 28th the first lot was in full flower, the second lot was beginning to flower and apparently a few days later, the third lot hardly showed its buds.

It was therefore clearly demonstrated that a high temperature immediately following the lifting of the bulbs can be very beneficial. This test was made with the variety *Helios*. Other varieties react differently and further tests are being made. Members of the American Amaryllis Society when traveling abroad should not miss the opportunity of calling at the school and seeing the very interesting work that is being carried on there.

(Propagation—James; continued from page 206)

Results from these trials are definite enough to warrant further experiments. Experience has proven that cuttings of various kinds of plants require treatment with different strengths of the hormone solution to get best results. Therefore it is very probable that seeds of various kinds of plants will require treatment with different strengths of the hormone in powder form.

At the time of writing this I note that Merck is advertising "Hormodin" powder in three strengths. I am also finding out that watering newly rooted cuttings of certain woody plants and young seedlings of certain plants with a 1 to 1 million solution of Vitamin B-1 promotes faster root action. Science is progressing so fast that it is hard to keep up with it.

8. THE SOCIETY'S PROGRESS*

SECRETARY'S MAIL BAG

Mr. Cecil Houdyshel of Laverne, Calif., reports that the 1939 Fall Amaryllis Show of the Society, held in conjunction with the Los Angeles County Fair at Pomona, Calif., was a real success, bigger and better than before. Mr. Houdyshel is the Society's representative in managing and advising for this event. The heat and humidity were unusually high during the show, he reports, truly "unusual," even for California.

Special mention is made of the plans now being laid for the 1940 National Amaryllis Show, which is scheduled for Southern California, in charge of a committee headed by Fred H. Howard, Herbert Medallist, and pioneer amaryllis breeder.

Mr. E. J. Anderson of Palm Beach, Florida, a recent addition to the Society's rolls, has become a real supporter of the Society's ideal of introducing new and rare amaryllids into cultivation. He imported a large collection of the rare "Blue Amaryllis," *Amaryllis procera*, from Brazil, and reports considerable success in getting them to grow, although he has had no flowers at the last account. He presented two of the long-necked bulbs to the Society.

Mr. Anderson sent a letter to the Secretary's office from his collector, Harry Blossfeld, in Brazil, who states that *Amaryllis procera* is cultivated "very well in the open" by him at Sao Paulo, "except during and after the flowering season, when they suffer from the rains." Mr. Blossfeld states that he protects the bulbs with hotbed sash during this period to avoid rotting of the bulbs. He takes care to give the bulbs plenty of air circulation.

Dr. A. B. Stout, the daylily specialist, spent the summer in Europe, and was scheduled to give a lecture for the Royal Horticultural Society on Daylilies, his specialty, early in September, when War intervened, and the writer has not heard, but presumes the engagement was cancelled.

Dr. A. B. Stout writes that the late Mr. T. L. Mead's daylily, "Chrome Orange," blooms in New York from May 29 to June 17, according to observations at the New York Botanical Garden. On another subject, he adds that he does not consider *Hemerocallis fulva* var. *rosea* the "best of the rosy-pink daylilies."

In the passing of Major George Churcher at Beckworth, Lindfield, England, in December, 1938, the Society lost one of its most loyal Eng-

*The material in this section was prepared by the wide awake Secretary of the Society, Mr. Wyndham Hayward. The Society has been most fortunate in being guided through its infancy and now to a robust coming of age by the brilliant and unselfish Secretary whose interest and enthusiasm never lag. We all owe him a very great debt of gratitude for a very difficult task exceedingly well done.—*Hamilton P. Traub*.

lish members and supporters, who will be not easily replaced in British horticulture.

Lt. Col. C. H. Grey in his book, "Hardy Bulbs," a remarkable three volume work of which the second volume includes the amaryllids, mentions *Hippeastrum equestre* (*Amaryllis belladonna*) as having been found in Burma, without definite citation or reference. In connection with this Mr. A. Worsley writes that he has bloomed bulbs of this amaryllid, a native to America, which came to him from West Africa, gathered there by a noted botanist. He presumes they were borne there by the sea or birds.

The Society is very much interested in new contacts with South American botanists and horticulturists, or persons living in the countries of Latin America having an interest in the growing and collecting of new and rare amaryllid bulbs and seeds. Let us hear from you.

Mr. J. R. Sealy advises that as the result of Mr. Milne-Redhead's researches, it has been determined that *Amaryllis longifolia* L., is the same as *Ammocharis falcata* (Jacq.) Herb., but that the plant is not an *Ammocharis*, actually, and hence must be put in a new genus. The new name is to be published in the Journal of the Linnean Society of London. However, Mr. Sealy advises that the plant we know as *Crinum longifolium* is not the true *Amaryllis longifolia* of Linnaeus. *Crinum longifolium*, the familiar garden subject, now becomes *C. bulbispermum*, we understand from Kew.

Mr. Sealy also writes the important news that he now considers *Crinum amabile* and *Crinum augustum* synonymous, the prior name having the best standing. This is, he writes, "a plant whose origin remains a mystery, and which may well be a hybrid as Herbert suggested." This is of interest to the Southern gardener, who often grows huge clumps of the *C. amabile* as the "Big Milk and Wine Lily."

Mr. A. Worsley mentions in letters his difficulties with an arid gale lasting 3 days at his home on the Isle of Wight, which in the winter of 1938-39 brought 11 degrees of frost and damaged or destroyed many tender and tropical plants, this having been the worst spell of winter weather in 40 years at Ventnor.

According to Mr. Worsley, the late W. Watson, director of Kew, originally proposed establishing a new genus or sub-genus for *Amaryllis procera*, in Mr. Worsley's honor, because he first made the bulb to thrive in cultivation in England. Mr. Worsley made a special visit to Brazil more than 30 years ago to study this plant in its native habitat, near Petropolis. Mr. Worsley published a note on *Amaryllis procera* in 1929 in the Gardeners Chronicle, with detail drawings of seeds, etc., based on his observations.

Mrs. Charles E. Wait of Coconut Grove, Florida, reports in March, 1939 the first blooming of a bulb of the Garfieldii hybrid amaryllis distributed to her and others by the Society some years earlier. These are

a specially well adapted strain for garden and pot culture, characterized by ease of handling and good colors and vigor. Mrs. Wait writes she is much pleased with her bulb, "after two years of nursing it, during which time it reached a diameter of 3 inches, and put out seven offsets. Very gorgeous it is, indeed."

Mr. Julian A. Steyermark, Assistant Curator of the Herbarium at the Field Museum of Natural History, Chicago, writes some interesting experiences about collecting bulbs of *Hymenocallis occidentalis* as far west as Missouri, where he states it is "fairly common in the southeastern Missouri lowlands." This species is also known from Tennessee and Georgia.

The annual Narcissus Show of the Westbury Horticultural Society, under the auspices of the Horticultural Society of New York, will be held at 598 Madison Avenue, April 25 and 26th, 1940. Further information may be obtained from the Secretary of the H. S. of N. Y., at that address.

Messrs. R. Wallace & Co., Ltd., of Tunbridge Wells, England, is one of firms taking a leading interest in the newer and finer daylilies in England. They write that their firm was the introducers or originators of the varieties *Aureole*, *Luteola*, *Golden Bell*, also *H. aurantiaca* and *H. aurantiaca* var. *Major*. They report growing many newer American varieties, including Dr. A. B. Stout creations from the New York Botanical Garden, and express the belief that interest in these forms will be increasing steadily in Great Britain from now on.

This note will serve to announce to the world the baptism of a new horticultural variety of *Crinum*, namely "Crinum X Wormley Bury," which has an interesting history. It was hybridized on a plant in the private collection of Major Albert Pam, in England, and is named after his famous country estate. The seed was sent to the American Amaryllis Society in Winter Park, Florida and there grown on the blooming size in 1939, when it was found to be a superior type to the common White *C. Powellii album* in some particulars, and much better than the less known *C. Powellii* var. *Haarlemense*, which it most nearly resembles. It is white with a faint pinkish blush.

Mr. O. Mohr, florist grower of Glostrup, Denmark, writes some interesting statistics regarding his venture in the greenhouse growing of amaryllis in ground beds. He has four greenhouses, with 15,000 white amaryllis seedlings, and 200,000 bulbs of other hybrid amaryllis. He states that he is selecting 100 of the best types for propagation into a wholesale stock of some 100,000 or more, eventually after some years.

Mr. S. Percy-Lancaster, leading Indian horticulturist, who receives the Herbert Medal this year for his work with *Cooperia-Zephyranthes* hybrids and his interest and research with amaryllis and crinums, reports that his original *Cooperanthes* crosses were made "both ways," "*Cooperia* on *Zephyranthes* and *Zephyranthes* on *Cooperia*," using *C.*

pedunculata and *C. Drummondii*, and various *Zephyranthes* species. The seedlings were then fertilized with pollen from *Zephyranthes*, he adds, so that the present race has more *Zephyranthes* blood than before.

Dr. G. Steiner, Principal Nematologist of the Division of Nematology of the U. S. D. A., sends an interesting leaflet on "Nematodes infesting Red Spider Lilies (*Lycoris radiata*)."

 This is the plant commonly grown in the Southern states as *Nerine sarniensis* (Guernsey Lily). Such pests of amaryllids are not very common.

Mr. L. B. Creasey, of the Parks and Gardens Department of Cape Town, Union of S. A., advises that the three types or species of *Hemerocallis* commonly found in Capetown gardens are the familiar *H. flava*, *H. citrina* and *H. fulva* Kwanso (double). *H. fulva*, the tawny old-time favorite, is also known, but very little is observed of the modern hybrid forms.

From the Right Hon. J. C. Smuts, Prime Minister of the Union of South Africa, distinguished World War General and notable amateur botanist, the Society has received the information that the General "has read your 1938 Year Book with much pleasure, and compliments you on the very high standard of Herbertia. Gen. Smuts is a warm admirer and personal friend of Dr. J. Hutchinson, of Kew Gardens, 1939 Herbert Medalist. Gen. Smuts' letter adds that he "has a very high opinion of Dr. Hutchinson and his work," and "very much appreciates the action of your Society in awarding its William Herbert Medal to Dr. Hutchinson, and thinks this action is most amply justified." "The systematic work of Dr. Hutchinson," the letter continues, "is of the highest order, and is probably the most important contribution made to phylogenetic systematics in our time."

SECRETARY'S MESSAGE

The publication of the significant 1939 Herbertia marks the close of another successful year in the history of the American Amaryllis Society, in spite of the obstacles of financial stress, wars abroad, and general economic difficulties so prevailing in the world of today.

The officers of the Society feel that in the compilation of this remarkable yearbook, with its main theme concerned with the South African amaryllids, this organization has produced another work worthy to rank with its predecessors. Only those who have attempted to guide the ship of plant society progress through the troubled seas of recent years, know the exhaustless inspiration, the diligent and tireless application, the long hours of midnight toil, and the persistent search for the right article and the best illustrations that have been required of the Society's veteran editor, Dr. Hamilton P. Traub. His zeal for scientific and general information and the spreading of the truth to others in the Society's chosen field, has never flagged in the long seasons since our organization came into being more than six years ago. Sometimes

when most amazed and confounded by his insuperable will and energy, the other officers of the Society feel like paraphrasing the ancient Roman gladiator's cry, "We who are about to collapse, salute thee!"

Besides the distinguished contributions to the 1939 Herbertia, offered in this issue, the Society can point to a steady increase in interest in the field of the amaryllids. However, it is indeed regrettable that the present War in Europe has brought a cessation of activities and cooperation at leading horticultural and botanical centers by necessity. We all hope for a speedy return to more normal conditions as soon as this is humanly possible. Such international military stringencies are the greatest handicaps to progress in gardening and general horticulture, especially as affecting the more specialized fields such as our Society's.

In 1939 the Society can look back to a highly successful National Amaryllis Show in Jacksonville, Florida, held in cooperation with the Jacksonville Circles of the Garden Club, an organization which has long taken a real interest in the promotion of amaryllids, daylilies and alstroemerias as decorative plants for Southern gardens.

The Society regrets the resignation of Mr. R. H. Gore of Fort Lauderdale, Florida, late in 1938, as Executive Secretary, since which time all secretarial work has been handled through the writer's Winter Park office. Mr. Gore served the Society efficiently and well during a difficult period of its history and has been voted the thanks of the directors. His many business interests made it impossible for him to give the work his undivided attention.

The Society has lost two of its directors by death in the last year, Richard Diener of California and Al. G. Ulrich of Missouri. Their families and friends are extended the sincere sympathy of the officers and members of the Society, to which they rendered valuable service in the years past. Mr. John T. Scheepers, who served on committee posts of the Society and was outstanding in his work as importer of commercial strains of fancy hybrid amaryllis, daffodils, etc., was another member lost to the Society through death in 1938.

With a sincerity undimmed by years of repetition, the secretary sends out his annual plea for continued support and cooperation of the members and friends of the Society in the coming season, especially as regards the prompt payment of dues and other help. The secretary hopes that all the members will continue to think of the Society as their very own, to send in reports of their adventures with amaryllids.

WYNDHAM HAYWARD,
Secretary.

*Lakemont Gardens,
Winter Park, Florida,*

October 1, 1939.

NOTICE OF 1940 NOMINATIONS

To the members of the American Amaryllis Society:

As provided by Article 5, Section 1, of the By-Laws of the American Amaryllis Society, which specifies that the secretary shall send to all voting members, not less than 90 days before the date of the annual election, a list of the offices to be filled and the names of those whose terms expire, this information is hereby incorporated in the data below, and same will take the place of a mailed notice to the members to this effect for the 1940 election:—

President.....	Mr. E. G. Duckworth
Vice-Presidents	Mr. T. H. Everett.
	Mr. E. A. McIlhenny
	Mr. Fred H. Howard
Secretary.....	Mr. Wyndham Hayward
Treasurer	Mr. R. W. Wheeler
Director-at-large for 3 years	

Article 7, Section 1 of the Constitution, provides that any voting member may submit to the Secretary, not less than sixty days before the annual meeting, nominations for officers and directors. These shall be submitted to a nominating committee, who shall select the candidates for the final ballot.

The Annual Meeting of the Society in 1940 will be held on the second Wednesday in April, as provided by Article 10, Section 1, of the Constitution, this being April 10, 1940. Therefore the names of nominees must be submitted by the voting members to the Secretary before February 11, 1940.

WYNDHAM HAYWARD,
Secretary.

October 1, 1939,
Winter Park, Florida.

The Secretary would like to take this opportunity of calling to the attention of members again the desirability of adding new members and enlarging the field of the Society by bringing it to the attention of horticulturists and garden lovers everywhere. The 1939 Year Book, we hope, will be considered a notable example of the Society's constant efforts to bring together the latest research, the newest accurate and useful information and interesting illustrations concerning the important amaryllis family. The income of your Society is used solely for the publishing of its Year Book, the holding of Amaryllis exhibitions, and generally supporting the other worthy aims of the organization.

REPORT OF TRIAL COLLECTIONS COMMITTEE

The Trial Collections Committee reports the following accessions to the Society's collection of plants and bulbs since the 1938 yearbook report was published. A number of members of the committee having greenhouse facilities for the growth of tender plants and bulbs, and the United States Department of Agriculture are cooperating with the Society in this work at present.

Members are urged to remember the Society with trial lots of rare bulbs or seeds in its field when this may be possible.

A-256—Seed pod of *Pamianthe peruviana*, from Maj. A. Pam, Wormley Bury, Broxbourne, Herts., England.

A-257—Seeds of unknown amaryllid collected in San Luis, mountain country, by J. R. Baez, February, 1938, received from Alberto Castellanos, Buenos Aires, Argentina; received in May, 1938.

A-258—Bulbs of yellow-flowered amaryllid collected near Santa Rosa Prov. of San Luis, received in May 1938 from Jose F. Molfino, Buenos Aires, Argentina.

A-259—Seeds of amaryllid, identity unknown, collected in dry state near Gobernacion del Neugue, received from Jose F. Molfino, Buenos Aires, Argentina.

A-260—Bulblets of *Amaryllis reticulata* var. *striatifolia*, from Mrs. J. Norman Henry, Gladwyn, Penna.

A-261—Bulbs of a yellow *Zephyranthes* (?) species received from E. N. Blake, Laredo, Texas.

A-262—Bulbs of two *Leucojum* species, or varieties of same, probably near *L. vernal*. Received from Cecil Houdyshel, LaVerne, Calif.

A-263—Bulbs of *Amaryllis ambigua* (possibly near *Amaryllis solandriflora* var. *conspicua*) from Cecil Houdyshel, LaVerne, Calif.

A-264—Bulbs of *Hymenocallis* species, from Cecil Houdyshel, LaVerne, Calif.

A-265—Tubers of *Alstroemeria chilensis*, received from H. L. Stinson, Seattle, Wash.

A-266—Bulbs of *Leucocoryne ixioides odorata*, from W. M. James, Santa Barbara, Calif.

A-267—Bulbs of *Hymenocallis* species, probably *H. occidentalis*, collected near Cordele, Ga., from Mrs. J. H. Churchwell, Jacksonville, Florida.

A-268—Bulbs of *Ammocharis coccinea* from the United States Department of Agriculture.

A-269—Bulbs of *Nerine falcata*, *N. lucida*, *N. flexuosa*, *Crinum crispum*, received from R. A. Dyer, Pretoria, Union of South Africa.

A-270—Bulb of the yellow-flowered *Cooperia Smallii*, from Mrs. W. D. Diddell, Jacksonville, Florida.

A-271—Two crinum bulbs, possibly Burbank hybrids, from Cecil Houdyshel, LaVerne, Calif.

A-272—Seeds of *Callicore* hybrids, including *multiflora rubra*, *X Hathor*, and *multiflora alba*. Received from E. O. Orpent, Santa Barbara, Calif.

A-273—Tubers of *Alstroemeria* species, from H. L. Stinson, Seattle, Wash. (including the rare *A. ligtu*).

A-274—Seeds of *Crinum Knightii*, received from Major A. Pam, England.

A-275—Seeds of fancy exhibition types of hybrid *Amaryllis*, from private collection of Baron Bruno Schroeder, England, received from Maj. A. Pam, England.

A-276—Seeds of *Habranthus texanus*, from Mrs. Rufus McIlhenny, Avery Island, La.

A-277—Seeds of *Pamianthe peruviana*, received from Maj. A. Pam, England. (Donated to Division of Plant Introduction and Exploration, U. S. D. A., Washington, D. C.)

A-278—Bulbs of *Amaryllis procera*, from E. J. Anderson, Palm Beach, Florida.

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1939-40

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*This committee makes recommendations to the Board of Directors for the annual award of the *George Yeld Memorial Medal*.

PUBLICATIONS OF THE AMERICAN AMARYLLIS SOCIETY

A complete file of *HERBERTIA*, the year book of the American Amaryllis Society, is indispensable to all who are interested in Amaryllids. A limited number of copies of the following are still available:—

Volume 1 (1934). Containing the biography of Henry Nehrling, and many valuable articles on amaryllids; with a portrait of Henry Nehrling and 16 other illustrations; a total of 101 pages.

Volume 2 (1935). Containing the autobiography of Theodore L. Mead, and many excellent articles on varieties, breeding, propagation, and culture of amaryllids; with portraits of Theodore L. Mead and David Griffith and 18 other illustrations; a total of 151 pages.

Volume 3 (1936). Containing the autobiography of Arthington Worsley, and important articles on description, genetics and breeding, physiology of reproduction, and amaryllid culture; with 3 portraits of Arthington Worsley, one color plate and 30 other illustrations; a total of 151 pages.

Volume 4 (1937). Containing the biography of William Herbert; the reprint of Herbert's essay, on Crosses and Hybrid Intermixtures in Vegetables; Dr. Darlington's essay, The Early Hybridizers and the Origins of Genetics, and many important articles on description; cytology, genetics and breeding; physiology of reproduction, and amaryllid culture; with two portraits, forty-four other plates and three figures; a total of 280 pages.

Volume 5 (1938). Containing the autobiography of Ernst H. Krelage; the history of amaryllid culture in Holland by Ernst H. Krelage, Dr. Uphoff's important article in which the name *Hippeastrum* is rejected; a revision of the tribes of the Amaryllidaceae; and the species of Amaryllis; outstanding articles on forcing amaryllids by Dr. Grainger and Prof. Dr. van Slogteren; and many other articles on description, cytology, genetics and breeding; physiology of reproduction, and amaryllid culture; with 33 plates and 2 figures; a total of 218 pages.

Volume 6 (1939). Dedicated to the Union of South Africa, and containing articles on South African amaryllids, including the history of botanical exploration for amaryllids in South Africa, the distribution of South African amaryllids in relation to rainfall, and a review of the Genus *Agapanthus* by Frances M. Leighton; a review of the Genus *Cyrtanthus*, with many excellent line drawings, by Dr. R. A. Dyer; other articles—*Zephyranthes* of the West Indies by Dr. Hume; the Tribe *Gilliesieae* by Dr. Hutchinson; rating of daylilies for garden value by Mr. Kelso; daffodil articles by Jan de Graaff, and many other items on description, cytology, breeding, propagation, and amaryllid culture; with 44 plates and 10 figures; a total of 258 pages.

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Vol. 7
1940



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HERBERTIA

VOLUME 7

DEDICATED TO
LATIN AMERICA

EDITED BY
HAMILTON P. TRAUB

ORLANDO, FLORIDA
THE AMERICAN AMARYLLIS SOCIETY
1940

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AMERICAN AMARYLLIS SOCIETY

Printed in the United States of America

Published March, 1941



This volume contains thirty-one plates and fourteen figures.

INTRODUCCION

El hecho de que esta edición de HERBERTIA sea dedicada a la América Latina está muy justificado puesto que esta parte del mundo aparece ser uno de los centros propagadores más importantes de Amaryllidaceas.

De los 51 géneros de bulbos amarilídeos identificados por Baker en 1888 entre los cuales está el *Ixiolirion*, 18 géneros o sea un 35 por ciento son oriundos de la América del Sur, la América Central, México y las Antillas; 4 géneros (*Crinum*, *Zephyranthes*, *Cooperia* y *Hymenocallis*,) o sea un 8 por ciento, se encuentran así mismo en la América de Norte al norte de México, esto es en el resto del Nuevo Mundo. Naturalmente, este es un cálculo verdaderamente conservador pues Baker suprimió algunos géneros que han sido recobrados de nuevo, a saber: *Ismene*, *Pyrolirion*, *Argyropsis* y *Habranthus*, siendo éste último el único que se encuentra fuera de la América del Sur.

La Sociedad Amaryllis Americana ha realizado una labor precursora de gran valor al escoger este extenso y bello grupo de plantas como digno de especial atención. Gracias a este patrocinio, y con la cooperación de las Américas así como también de entusiastas extrajeros, el progreso de las Amaryllidaceas está asegurado. Hacia este fin recomendamos tanto a los botánicos como a los horticultores de la América Latina que hagan uso de esta magnífica oportunidad dando a la publicidad en HERBERTIA artículos acerca de las Amaryllidaceas, colaborando de este modo a la realización de los objetivos de esta sociedad.

Es de interés primordial el hecho de que en varias ediciones de HERBERTIA hayan aparecido importantes contribuciones de la América Latina. Así mismo vemos en la actual edición Latino Americana una excelente biografía del gran botánico Dr. Rudolph Amandus Philipp, cuyo nombre estará ligado eternamente al descubrimiento de muchas especies de Amaryllidaceas. El Sr. Castellanos ha contribuido también con unos datos biográficos del fenecido Dr. Holmberg, gran hombre de ciencia quien hizo un estudio especial de las Amaryllidaceas.

Está pues muy justificado el hecho de que en esta edición se publique la descripción original de *Amaryllis aglaiae* Castellanos, oriunda de la América del Sur.

Como conclusión y en nombre de los países miembros de la Unión Panamericana deseo extender mis felicitaciones más cordiales a los miembros de la Sociedad Amaryllis Americana por la excelente y desinteresada labor realizada.

—L. S. Rowe,
Director General
Unión Panamericana

2 Octubre de 1940.

INTRODUCAO

É apropriado que esta edição da HERBERTIA seja dedicada à América Latina, visto que esta parte do mundo parece ser um centros propagadores mais importantes das Amaryllidáceas.

Dos 51 gêneros de amarilídeas bolbosas identificados por Baker em 1888, entre os quais está o Ixiolirion, 18 gêneros, ou seja 35 por cento, são oriundos da América do Sul, América Central, México e as Antilhas; 4 gêneros (*Crinum*, *Zephyranthes*, *Cooperia* e *Hymenocallis*), ou seja 8 por cento também são encontrados na América do Norte ao norte do México, isto é, em outras regiões do Novo Mundo. Naturalmente, este é um cálculo bastante conservador, sendo que Baker suprimiu alguns gêneros que recentemente têm sido restabelecidos, a saber: *Ismene*, *Pyrolirion*, *Argyropsis* e *Habranthus*, todos os quais, com a exceção do último, são encontrados somente na América do Sul.

A Sociedade Amaryllis Americana tem realizado um trabalho pioneiro de grande valor em se dedicando ao estudo deste extenso e belo grupo de plantas. Devido ao seu patrocínio, e com a cooperação das Américas assim como também de entusiastas estrangeiros, o progresso das Amaryllidáceas está assegurado. Visando o mesmo fim, convidamos tanto os botânicos os horticultores da América Latina a aproveitarem a oportunidade que se lhes apresenta para publicarem na HERBERTIA artigos sobre as Amaryllidáceas, colaborando deste modo na realização dos objetivos desta sociedade.

É interessante notar que várias contribuições valiosas procedentes da América Latina têm aparecido em outras edições da HERBERTIA, e que a presente publicação latinoamericana contém uma excelente biografia do grande botânico, o dr. Rudolph Amandus Philippi, cujo nome será para sempre ligado com o descobrimento de muitas espécies de Amaryllidáceas. O sr. Castellanos contribuiu também com uma resenha biográfica do falecido dr. Holmberg, cientista de grande destaque que fez um estudo especial das Amaryllidáceas. Aparece pela primeira vez nesta edição, muito oportunamente, a descrição da *Amaryllis aglaiae* Castellanos, oriunda da América do Sul.

Em conclusão e em nome dos países membros da União Panamericana desejo estender as minhas mais cordiais felicitações aos membros da Sociedade Amaryllis Americana pelo excelente e desinteressado trabalho realizado.

—L. S. Rowe,
Director Geral,
União Panamericana

2 de Outubro de 1940.

INTRODUCTION

It is quite fitting that this issue of HERBERTIA should be dedicated to Latin America since this part of the world is apparently one of the chief centers of amaryllid dispersal. Of the 51 genera of bulbous amaryllids recognized by Baker in 1888, including *Ixiolirion*, 18 genera, or 35 per cent, are indigenous to South America, Central America, Mexico and the West Indies; 4 genera (*crinum*, *Zephyranthes*, *Cooperia* and *Hymenocallis*), or 8 per cent, are shared with North America above Mexico, or the rest of the world. This is a conservative estimate since Baker had suppressed some genera that have been recently revived, namely, *Ismene*, *Pyrolirion*, *Argyropsis* and *Habranthus*—all except the last named found only in South America.

The American Amaryllis Society has carried on a worthy pioneer work in singling out this great and beautiful group of plants for particular attention. Due to this sponsorship, with the cooperation of all the Americas, and the amaryllid enthusiasts in other lands, the steady advancement of the amaryllids is assured. Toward this end botanists and horticulturists in Latin America are urged to take advantage of the opportunity of publishing articles on amaryllids in HERBERTIA and thus aid in accomplishing the objectives of the Society.

It is of interest to note that some notable contributions from Latin Americans have appeared in past issues of HERBERTIA, and that in the present Latin American issue there is a fine biography of the great botanist, Dr. Rudolph Amandus Philippi, whose name is forever linked with the discovery of many amaryllids. Sr. Castellanos contributes a biographical sketch of Dr. Holmberg, the late great savant, who made a special study of amaryllids. It is fitting that the original description of *Amaryllis aglaiae* Castellanos, native to South America, be published in this issue.

In conclusion, and on behalf of the countries members of the Pan American Union, I wish to extend congratulations to the American Amaryllis Society for a labor of love so ably carried on by this organization.

—L. S. Rowe,
Director General,
Pan American Union

October 2, 1940.

PREFACE

As pointed out in the Introduction, it is highly fitting that this Edition of *Herbertia* is dedicated to Latin America where such a wealth of amaryllids is found. Ever since the first plants were sent to Europe from the Americas, there has come a never ending parade of amaryllids from this source. One of the Latin Americans most intimately connected with the discovery of this vast floral wealth was the late Dr. Rodolfo Amando Philippi, 1808-1904, and we are grateful to his grandson, Dr. R. A. Philippi II of Santiago, Chile, for the portrait and biography of this great botanist. We are fortunate also to have the excellent portrait and biography of the late Dr. Eduardo Ladislao Holmberg, the late great scientist, contributed by Sr. Alberto Castellanos of Buenos Aires, Argentine. Sr. Castellanos also describes a new South American species of *Amaryllis* in this edition.

Dr. F. C. Hoehne, Director-Superintendent of the Department of Botany, Secretariat of Agriculture, Industry and Commerce, State of Sao Paulo, Brazil, writes under date of Nov. 4, 1940, that due to illness he regrets to report that he has not been able to prepare the contemplated article on the amaryllids of Brazil for the Latin American Edition, but he hopes to prepare such a paper for a future issue of *Herbertia*. Dr. Hoehne's many friends in all the Americas will be glad to hear that he has recovered and is back at his important botanical work.

Appropriately, Dr. Goodspeed of the University of California begins his very important series on the amaryllids collected on plant exploration trips to South America. Another important event is fully described in the text—The Brazilian "Blue *Amaryllis*", *Amaryllis procera*, bloomed in Florida. The bulbs were imported by Mr. E. J. Anderson of Palm Beach, Florida. Mrs. Wilhelmina F. Greene, the artist of Winter Park, Florida, saw the plant in bloom and has kindly furnished an appropriate cover design featuring the "Blue *Amaryllis*".

We owe a debt of gratitude to the modest, indefatigable worker, W. M. James, of Santa Barbara, California, who is doing very valuable work in the culture of amaryllids. He has also begun breeding experiments, including the study of chromosome numbers in amaryllids, and reports his first successes with *Nerine filifolia* hybrids. His contributions in this field are among the most important being made at the present time. As the movement for the advancement of the amaryllids gains ground other important specialists in this field will surely appear. Many have already started and only time is needed to bring their work to fruition.

The interest in the daylily is still mounting, and this is reflected in the amount of space devoted to this subject in this issue. Dr. Stout and Miss Kojan contribute very valuable articles from the New York Botanical Garden, and Prof. Watkins reports on important experiments from the University of Florida. We regret to announce the death of Mr. Kelso who pioneered in the evaluation of daylilies. His courageous beginning in this field will immortalize his memory to all amaryllid enthusiasts, present and future. Mr. Steichen resigned as Chairman of

the Daylily Committee on account of ill health, and he was succeeded by Mr. Elmer A. Claar, who reports on the 1940 activities. Mr. J. Marion Shull has given the members a concise data card for *Hemerocallis* that has been officially adopted. This is a real step in advance.

Another group that is deservedly gaining in popularity is the alstroemerids. Mr. Hannibal reports on *Alstroemeria* activity on the West Coast, Mr. James adds a note on *Bomarea acutifolia*, Dr. Uphof presents two interesting articles, and Dr. Goodspeed writes of the alstroemerids of South America.

In this brief preface it is not possible to touch on the many other important contributions appearing in this issue, and we take this opportunity of thanking the contributors, one and all, for their helpful cooperation in making this edition complete in all departments. In spite of World War II, our courageous English friends are keeping in touch with us. Major Albert Pam takes us for an intimate walk in his garden that we will all treasure. We are glad to welcome Mr. H. W. Pugsley, who received the 1940 Herbert Medal for his important researches on the classification of the amaryllids.

Finally, let us take a glance at what future issues of *Herbertia* have in store for you. The 1941 issue will feature the daylily, and will be dedicated to the pioneers in daylily breeding—George Yeld, Willy Mueller, Amos Perry, C. S. Betscher, and A. B. Stout. It will be in the nature of a tribute to them from those who have entered this field more recently. There will be biographies and portraits of the pioneers, a detailed inventory of past achievements and plans for the future.

The 1942 issue will feature the Alstroemerids—*Alstroemeria*, *Bomarea*, *Leontochir* and *Schickendanzia*. Detailed plans are being developed by the alstroemerid enthusiasts at the present time and will be announced in the next issue.

The 10th. Anniversary issue will appear in 1943, and will be dedicated to those who helped to advance the amaryllids during the past decade. There will be a detailed inventory of past accomplishments and plans for the future.

In following years, it is planned to feature some one particular group of amaryllids each year. However, there will always be a well balanced amaryllid menu, as in the past, so that the advancement of the whole family in popular esteem will go steadily on.

*U. S. Horticultural Station,
Beltsville, Maryland,
October 7, 1940*

—*Hamilton P. Traub*

TABLE OF CONTENTS

	PAGE
Latin American Edition Cover Design, <i>Amaryllis procera</i> , by Mrs. Wilhelmina F. Greene	
Introduction, L. S. Rowe	3
Introducao, L. S. Rowe	4
Introduction, L. S. Rowe	5
Preface	6
Instructions for Contributors	11
Errata, Vol. 6, <i>Herbertia</i> , 1939	11
Dedication	12
Biografia del Dr. Rodolfo Amando Philippi, 1808-1904, Dr. R. A. Philippi II	13
Biography of Dr. Rodolfo Amando Philippi, 1808-1904, Dr. R. A. Philippi II	14
Dr. Eduardo Ladislav Holmberg, a biographical sketch, Alberto Castellanos	15
<i>Amaryllidaceae</i> from the University of California Botanical Expeditions to the Andes, T. H. Goodspeed	17
Carl Purdy, Pioneer California Horticulturist and Landscape Artist, Willis Linn Jepson, Katherine D. Jones, Alice Eastwood, and George B. Furniss	31
Herbert William Pugsley, a biographical sketch, Hamilton P. Traub	35
In Memoriam—George DeWitt Kelso, Wyndham Hayward	36
Excerpts from Letter from Mrs. George DeW. Kelso	39
Notes on <i>Amaryllids</i> , 1939-1940, Maj. Albert Pam	39
<i>Amaryllid</i> Musings, W. M. James	42
1. REGIONAL ACTIVITY AND EXHIBITIONS	
Autumn <i>Amaryllis</i> Shows, Pomona, Calif., 1939 & 1940, Cecil Houdyshel	45
National <i>Amaryllis</i> Show, 1940, Montebello, Calif., Cecil Houdyshel	48
Southeastern <i>Amaryllis</i> Show, Orlando, Fla., 1940, Wyndham Hayward	50
First National Daylily Show, Orlando, Fla., 1940, Wyndham Hayward	52
California Daffodil Conference, 1940, Frank A. Leach	53
California Spring Garden Shows, 1940, L. S. Hannibal	54
Visits to the Gardens of Daylily Enthusiasts, Elmer A. Claar	55
2. COLOR DESCRIPTION	
Preserving Herbarium Specimens in Natural Colors, Hamilton P. Traub	62
3. DESCRIPTION, CLASSIFICATION AND PHYLOGENY	
<i>Amaryllis aglaiae</i> Castellanos <i>sp. nov.</i>	63
<i>Zephyranthes Fosteri</i> Traub <i>sp. nov.</i>	65
<i>Zephyranthes Lindleyana</i> Herb., J. C. Th. Uphof	67
A Checklist of <i>Amaryllidaceae</i> , Tribe <i>Allieae</i> , in the United States, C. V. Morton	68
<i>Allium Coryi</i> , H. B. Parks	84
Phylogenetic Position of <i>Sprekelia</i> , Hamilton P. Traub	87
Bodant Hybrid <i>Amaryllis</i> , Lord Aberconway	89
<i>Crinum Forbesianum</i> , Sarah V. Coombs	90
<i>Crinum erythrophyllum</i> , Wyndham Hayward	92
Spathes of <i>Amaryllis procera</i> , Hamilton P. Traub	94
<i>Amaryllis Blumenavia</i> , Hamilton P. Traub	96
Official Data Card for <i>Hemerocallis</i> , J. Marion Shull	98
Daylilies Rated for Garden Value, Season, 1939, George DeW. Kelso	102
Daylily Musings and 1940 Experimental Daylily Poll, Elmer A. Claar	110
Revised Plan, and Instructions to Daylily Committee	125
Registration of New Clones	128

	PAGE
HYBRID AMARYLLIS	
Introductions by R. W. Wheeler	130
Hybrid Amaryllis—Louise Hayward, Wyndham Hayward	131
Hybrid Amaryllis—Mont Blanc, Dr. R. W. Kenny	131
HYBRID DAYLILIES	
Introductions by J. Marion Shull	132
Introductions by R. W. Wheeler	132
Introductions by Hamilton P. Traub	134
HYBRID NERINES	
Hybrid Nerine— <i>Chameleon</i> , W. M. James	135
IMPROVED EUCHARIS	
New Eucharis grandiflora clone— <i>Julius Thomas</i> , Karl J. Easton	136
The Enigma of <i>Cyrtanthus vittatus</i> (?), Hamilton P. Traub	137
Wilhelmina Freeman Greene's Water Color Drawings, Hamilton P. Traub	138
4. CYTOLOGY, GENETICES AND BREEDING	
Daylily Breeding and Testing Roundup	139
Daylily Testing in Minnesota, Robert Schreiner	139
Daylily Breeding Experiences, J. Marion Shull	141
Selective Breeding of Hemerocallis at the University of Florida, John V. Watkins	142
The Nesmith Daylilies, Mrs. Ethel P. Dewey	143
Hybridizing Daylilies in Florida, Wyndham Hayward	145
Daylily Notes from West Virginia, Leon H. Leonian	146
Why I am Interested in Daylilies, Elmer A. Claar	149
Daylily Breeding in Subtropical Florida, Hamilton P. Traub	151
Foliage Habits of Daylilies, A. B. Stout	157
Chromosomes of <i>Clivia cyrtanthiflora</i> , Edith Hendrix Wittlake	166
<i>Habranthus brachyandrus</i> and breeding possibilities, Hamilton P. Traub	167
Prof. Hoover on <i>Brodiaea</i> and <i>Dichelostemma</i> , Hamilton P. Traub	168
5. PHYSIOLOGY OF REPRODUCTION	
Growing Alstroemerias from seeds, W. M. James	169
Note to Editor; Growing Alstroemerias from Seeds, Lela V. Barton	170
Shipment of Bulbs in Moist Condition, L. S. Hannibal	170
Attempts to grow <i>Lycoris</i> from Seeds, C. W. Culpepper	171
6. AMARYLLID CULTURE	
<i>Amaryllis candida</i> , <i>Hymenocallis speciosa</i> , <i>Ismene amancaes</i> , <i>Phaedranassa Carmioli</i> , and <i>Bomarea auctifolia</i> , W. M. James	175
Crinums and other amaryllids in North Carolina, Elizabeth Lawrence	181
<i>Sprekelia</i> and <i>Chlidanthus</i> , W. E. Rice	185
<i>Hymenocallis Floridana</i> in the Greenhouse, Edith Hendrix Wittlake	185
The Blue-Flowering Amaryllis, <i>Amaryllis procera</i> , Harry Blossfeld	186
The Blue Amaryllis, <i>Amaryllis procera</i> , in Florida, E. J. Anderson	192
Alstroemerias: A neglected opportunity, J. C. Th. Uphof	194
<i>Bomarea ovata</i> and other Central American Bomareas, J. C. Th. Uphof	199
Notes on Alstroemeria activity on the West Coast, L. S. Hannibal	203
Notes on Alstroemerias, P. H. Brydon	204

	PAGE
Leucocoryne as a Pot Plant, Wyndham Hayward	205
Daylilies in an Illinois Garden, Mrs. Roland S. Read	205
Flowering Periods for clonal varieties of Daylilies, Miss Selma C. Kojan	209
Daylily Foliage as an element in the garden design, John V. Watkins	212
The Mildred Orpet Daylily in California, Mildred Orpet	216
Hybrid Amaryllis in Georgia, Arthur J. Jones	216
A note on <i>Nerine filifolia</i> Baker, R. A. Dyer	220
7. HARVESTING, STORAGE AND FORCING	
Harvesting and storage of amaryllid bulbs, W. M. James	221
8. THE SOCIETY'S PROGRESS	
Secretary's Mail Bag	224
Secretary's Message	226
Notice of 1941 Nominations	227
Data Card for <i>Hemerocallis</i>	228
Report of Trial Collections Committee	228
Officers and Committees	230
Publications of the Society	232
Announcement—Amaryllidaceae, First Edition	234
The Buyers' Guide	
Bulbs as an investment, W. M. James	235
Advertisements	236

LIST OF ILLUSTRATIONS—PLATES

Plate 168 Frontispiece portrait—Dr. Rudolfo Amando Philippi, 1808-1904	facing page 13
Plate 169 <i>Placea</i> sp. and <i>Crocopsis fulgens</i>	19
Plate 170 <i>Alstroemeria violacea</i>	23
Plate 171 <i>Alstroemeria Hookeriana</i>	27
Plate 172 Portrait—Herbert William Pugsley—Herbert Medalist, 1940	37
Plate 173 Southeastern Amaryllis Show, 1940	47
Plate 174 <i>Allium Coryi</i> , M. E. Jones	85
Plate 175 <i>Sprekelia formosissima</i> , photomicrograph showing tube	88
Plate 176 Hybrid Amaryllis raised at Bodant	91
Plate 177 <i>Amaryllis procera</i> , plant that flowered at Orlando, Fla.	93
Plate 178 <i>Amaryllis Blumenavia</i>	97
Plate 179 Official data card for <i>Hemerocallis</i>	99
Plate 180 Hybrid Amaryllis—Louise Hayward	129
Plate 181 Evergreen and dormant habit in daylily	156
Plate 182 Breaking dormancy in daylily	161
Plate 183a <i>Amaryllis candida</i>	173
Plate 183b <i>Hymenocallis speciosa</i>	174
Plate 184 <i>Ismene amancaes</i>	177
Plate 185 <i>Phaedranassa Carmioli</i>	178
Plate 186 <i>Bomarea acutifolia</i>	179
Plate 187 <i>Sprekelia formosissima</i>	183
Plate 188 <i>Chlidanthus fragrans</i>	184
Plate 189 <i>Hymenocallis Floridana</i>	187
Plate 190 <i>Amaryllis procera</i> , plant that bloomed at Palm Beach, Fla.	193
Plate 191 <i>Alstroemeria latifolia</i> and <i>A. lineatifolia</i> ; from Ruiz et Pavon	197
Plate 192 <i>Bomarea ovata</i> (Cav.) Mirb.	202

	PAGE
Plate 193 <i>Leucocoryne ixiioides</i> var. <i>odorata</i> as a house plant	206
Plate 194 Foliage habits of daylilies— <i>Domestico</i> , <i>The Gem</i> , <i>Mikado</i> and <i>Hyperion</i>	213
Plate 195 Hybrid Amaryllis in Georgia	217
Plate 196 <i>Nerine filifolia</i>	219
Plate 197 Bulb grading screens in use	223

FIGURES

Figure 45 Portrait—Dr. Eduardo Ladislao Holmberg, 1852-1937	15
Figure 46 Portrait—George DeWitt Kelso, 1867-1940	38
Figure 47 Bulbs of <i>Brunsvigia-Callicore</i> hybrids	42
Figure 48 <i>Amaryllis Aglaiae</i> , Castellanos, <i>sp. nov.</i>	63
Figure 49 Map of Northwestern Argentina, showing range of <i>Amaryllis Aglaiae</i>	64
Figure 50 <i>Zephyranthes Lindleyana</i>	67
Figure 51 Spathes of <i>Amaryllis procera</i>	95
Figure 52 Hybrid Amaryllis—Mont Blanc	132
Figure 53 Hybrid Nerine—Chameleon	135
Figure 54 Segregation for evergreen and dormant habits in daylily	164
Figure 55 Somatic chromosomes in <i>Clivia cyrtanthiflora</i>	166
Figure 56 Fruit of <i>Bomarea acutifolia</i>	180
Figure 57 Chart showing blooming periods of 64 daylily clones	209
Figure 58 Bulb storage racks and trays; heater for drying bulbs	221

ERRATA

HERBERTIA, VOL. 6, 1939

- Page 31, 1st. line from top, for “was” read “were”.
- Page 72, change “23” to “24” preceding “*Tuckii*”.
- Page 103, Index of Species, after “*helictus*” change “38” to “39”.
- Page 105, 19th. line from bottom, for “1653” read “1753”.
- Page 166, 6th. line from top, for “be” read “by”.
- Page 169, Plate 157, for “*Hermerocillas*” read “*Hermerocallis*”.
- Page 198, 5th. line from bottom, for “Sargant” read “Sargent”.

INSTRUCTIONS FOR CONTRIBUTORS

Year Book Correspondence. Correspondence regarding articles and illustrations for *Herbertia*, the Year Book of the American Amaryllis Society, is cordially invited. The annual news-letter or articles from Corresponding Members and Regional Chairmen of Trial Collections should be forwarded, if at all possible, by April of each year, or earlier, depending upon the distance, so as to reach the editor in ample time for publication. Copies of manuscripts should be retained by the authors as an insurance against loss in the mails.

Manuscripts should be *typewritten* if at all possible and *double spaced*; photographs should have the *name of the owner* to whom credit should be given, and the *name and size of the subject*, written on the back.

When making photographs of amaryllids, an effort should be made to include the whole plant—*stem*, if any, *leaves*, *scape* and *flowers*. Separate photographs of the *bulb* and *roots* are also valuable in some cases. These remarks do not apply to cut-flowers.

*This volume of Herbertia
is dedicated to Latin America,
particularly to those, who,
in the past and present, have been,
or are devoted to the amaryllids
of South and Central America,
the West Indies and Mexico.*



Dr. Rodolfo Amando Philippi, 1808-1904

BIOGRAFIA DEL DR. RODULFO AMANDO PHILIPPI, 1808-1904.

DR. R. A. PHILIPPI,

Museo Nacional, Santiago, Chile

Don Rodolfo A. Philippi nació en Charlottenburg, Berlin el 14 de Septiembre de 1808. Hizo sus primeros estudios en el famoso Instituto de Pestalozzi, en Iverdon, Suiza.

En 1822 terminó los estudios en el Gimnasio llamado Convento Gris de Berlin. Allí inició su afición por la Botánica descubriendo en 1826 cuatro plantas nuevas en la Marca de Brandenburgo. Por consejo de sus padres estudió Medicina en la Universidad de Berlin, recibiendo su título de Doctor en esta ciencia a fines de 1830. Su memoria de grado se tituló “Los Ortópteros de Berlin”. Nunca sintió agrado por la Medicina y desde que recibió su título se dedicó exclusivamente a las Ciencias Naturales y en especial a la Botánica.

En 1837 emprendió un largo viaje al Sur de Italia donde hizo una magnífica colección de Moluscos aun hoy día existente en el Museo de Santiago. Publicó dos tomos sobre Moluscos de Sicilia que fueron premiados por el Rey de Prusia.

A su regreso fué profesor del Politécnico de Cassel, en el Ducado de Hessen-Nassau. Allí permaneció hasta 1848, época en que sobreviene la famosa revolución de dicho año. El Dr. Philippi, por sus ideas democráticas tuvo que dejar el cargo y pensar en buscar su vida en otra parte. Estas razones lo impulsaron a emigrar a Chile donde llegó en 1851.

Hizo de Chile su segunda patria y en 1853 fué nombrado Director del Museo Nacional. Permaneció en ese puesto hasta el año 1900, año en que fué sucedido por su hijo Don Federico Philippi.

La obra del Dr. R. A. Philippi en Chile fué inmensa. El Museo que era una sola pieza se transformó en el mejor de su época en Sud-América. Exploró gran parte del país, su viaje principal fué el Viaje al Desierto de Atacama en 1854 que dió lugar a numerosos descubrimientos científicos.

Como era propio de la época, él se dedicó a todas las ramas de la Historia Natural, preferiendo, sin embargo, la Botánica.

Durante su larga vida hizo 450 publicaciones científicas. Las Colecciones del Museo de Santiago poseen un enorme número de Tipos del Dr. Philippi.

Fué también Profesor en la Universidad, por lo que dejó numerosos alumnos.

La labor de Philippi fué enorme, y hoy día cualquier estudio que se haga sobre las Ciencias Naturales de Chile tiene que consultar los Trabajos o los Tipos de especies del ilustre sabio alemán.

Falleció en Santiago en 1904 a los 95. Años de edad. Se le hicieron funerales nacionales.

BIOGRAPHY OF DR. RODULFO AMANDO PHILIPPI, 1808-1904 *

DR. R. A. PHILIPPI,

*National Museum of Natural Sciences,
Santiago, Chile*

Don Rodulfo A. Philippi was born in Charlottenburg, Berlin, Germany, the 14th of September, 1808. He received his elementary education at the famous Pestalozzi Institute at Iverdon, Switzerland.

In 1822 he concluded his studies in the "Gymnasium" known as the Gray Convent of Berlin. There he first demonstrated his aptness for botany, discovering in 1826 four new plants in the Mark of Brandenburg. On the advice of his parents he studied medicine in the University of Berlin, receiving the degree of Doctor in this science at the end of 1830. His graduating thesis was entitled *The Orthoptera of Berlin*. He was never seriously inclined toward Medicine, and from the time of receiving his degree he devoted himself exclusively to the natural sciences, and especially to Botany.

In 1837 he undertook a long journey to Southern Italy, where he made a magnificent collection of mollusks, which may be found to this day in the Museum of Santiago, Chile. He published two volumes on the *Mollusks of Sicily*, which were the subject of special honors awarded to him by the King of Prussia.

After his return he was Professor of Polytechnics at Cassel, in the Duchy of Hessen-Nassau. There he remained until 1848, the year of the famous revolution. Dr. Philippi, because of his democratic ideas, was obliged to give up his position and to think of seeking a new field for his life's work. These reasons impelled him to emigrate to Chile, where he arrived in 1851. He made Chile his second fatherland, and in 1853 he was named Director of the National Museum. He remained in this post until 1900, when he was succeeded by his son, Don Federico Philippi.

The work of Dr. Rodulfo Amando Philippi in Chile was immense. The Museum, which was in a single room, was transformed into the best of its time in South America. He explored a great part of the country, his principal journey being the *Trip to the Desert of Atacama* in 1854, which resulted in numerous scientific discoveries. As was the custom of the period, he dedicated himself to all branches of Natural History, preferring, however, Botany.

During his long life, he published 450 scientific papers. The collections of the Museum of Santiago possess an enormous number of type specimens from Dr. Philippi's collecting trips. He was also a professor in the University of Chile and was survived by many students who had

* TRANSLATORS NOTE—Dr. R. A. Philippi II, the author of this biographical sketch, is the grandson of the late great Chilean botanist. He is a noted ornithologist in his own right and is associated with the National Museum, Santiago, Chile. The American Amaryllis Society is greatly indebted to Dr. Philippi II for his interesting biography that will be treasured by all students of South American botany. The Society also owes a debt of gratitude to Dr. Alberto Castellanos of Buenos Aires who introduced us to Dr. R. A. Philippi II.—W. HAYWARD.

received their training under him. The labor of Dr. Philippi was no less than enormous, and today, no matter what study is undertaken in the natural sciences of Chile, one is obliged to consult the works or the type specimens of the illustrious German-Chilean savant.

He died in Santiago in 1904 at the age of 95, and national honors were rendered to him at the funeral services.

EDUARDO LADISLAS HOLMBERG, A BIOGRAPHICAL SKETCH

ALBERTO CASTELLANOS,

Museum of Natural Sciences, Buenos Aires, Argentine

The late Eduardo Ladislas Holmberg greatly influenced the development of science in his native country, especially in the natural sciences. His work parallels, though on a lesser scale, that of Erasmus Darwin and Wolfgang Goethe in their respective countries. His grandfather was an Austrian artilleryman who arrived in Argentina during the era of its emancipation, who was one of those who helped to achieve independence, and who remained in the country that he helped to liberate. His father took part in the civil wars, and served his country in a political capacity.

Eduardo Ladislas Holmberg was born in the City of Buenos Aires, June 27, 1852, and received his early education in an English school in that City. He later studied medicine, completing this work in 1880. The degree of Doctor of Medicine and Surgery was conferred upon him, his thesis being, "El Fosfeno". He never practiced his profession, however, and immediately dedicated himself to the study of nature, especially zoology, and botany.

He was the first director of the municipal Zoological Garden of Buenos Aires, and he founded the publication (Review) of this institution. He was professor of Natural Sciences in the Normal School of Professors, inspector of Secondary Education, Member of the National Academy of Sciences in Cordoba, (contributing many scientific papers to its Bulletin and Acts), professor of Botany in the School of Natural Sciences of the Faculty of Exact, Physical and Natural Sciences of the University of Buenos Aires, being the first Argentine to occupy the last named chair. When he retired on pension, he was honored with the presidency of the Academy of Exact, Physical and Natural Sciences.

He was an enthusiastic and pioneer propagandist for Darwinism in Argentina, and on the death of Darwin, he gave one of his most original and stimulating lectures at his conference on May 19, 1882, in the Círculo Médico Argentino entitled "Charles Robert Darwin".

He explored a great part of Argentina,—Mendoza, Chaco, Misiones, etc. His "Journey to Misiones", published in 1887-1889, is a book that contains immortal chapters of great literary value, such as the description of the subtropical rain-forest. On the anniversary of Argentinian independence, May 10, 1910, he published a poem dedicated to the Araucanian Race, entitled "Lin-Calel". In collaboration with some of

his pupils and colleagues he founded the scientific reviews, "El Naturalista Argentino" and "Apuntes de Historia Natural". These are at present very scarce. Only two volumes of the latter appeared, Vol. 1 (1909), and Vol. 2 (1910). In the first appeared several collaborations in insects and molluscs.



Fig. 45. Dr. Eduardo Ladislao Holmberg,
1852-1937.

His great accomplishments in languages, literature, and the arts gained for him the reputation of an important writer, and in his venerable old age he was indeed the dean of Argentinian culture. Besides his scientific publications, already referred to, he produced others of scientific and literary interest, including the short story, the novel and verse, and it was natural that when the Guatemalan poet, Rubén Darío, resided in Buenos Aires, Holmberg was one of his friends.

His pupil, the botanist Hicken, dedicated to him the Genus *Holmbergia*, of the Chenopodiaceae, and the entomologist, L. F. Deletang, dedicated to him the Genus *Edholmbergia*, of the Cicadidae. Although Zoology was the branch of science that attracted his attention most, he was genuinely interested in botany as the following list of citations shows:

Ojeada sobre la Flora de la provincia de Buenos Aires. Censo de la provincia de Buenos Aires de 1881. (1882): 56-68.

Clave analítica de las familias de las plantas. Buenos Aires (1895); 2nd. ed. (1904): 1-88.

Flora de la República Argentina. Censo de 1895; I (1898): 385-474; with 1 map.

Sobre el representante de una familia nueva para la Flora Argentina. Anales Soc. Cient. Argentina. XLIX (1900): 22.

Hippeastrum flamigerum Holm. nov. sp. Anales Museo Hist. Nat. Buenos Aires. 3a ser. I (1902): 411.

Amaryllidaceae platenses nonnullae. Ibid. II (1903): 77.

Zephyranthes jujuyensis Holm. nov. sp. Ibid. IV (1905): 523.

Zephyranthes porphyrospila Holm. nov. sp. Ibid. p. 65.

Amarilidáceas argentinas indígenas, y exóticas cultivadas. Anales del Museo Nac. de Buenos Aires. XII: 75-192. (1905); with 1 map.

Botánica elemental. Buenos Aires. (1909) pp. 1-478; with 3 maps.

In *Herbertia* 1936, a tribute to Dr. Holmberg who was then in his 83rd. year, was contributed by Sr. José F. Molino and Sr. Salvator Siciliano. In the following year, Dr. Holmberg died in his native city, Buenos Aires, November 4, 1937.

AMARYLLIDACEAE FROM THE UNIVERSITY OF CALIFORNIA BOTANICAL EXPEDITIONS TO THE ANDES

T. H. GOODSPEED

*Professor of Botany and Director of the Botanical Garden,
University of California, Berkeley*

During the last ten years the University of California Botanical Garden has sent out three plant hunting expeditions to secure new or little known species of scientific and ornamental importance. The first of these expeditions, under the direction of Dr. Joseph F. Rock, covered a large area in western China and Tibet and sent back to California a numerous and valuable collection of herbarium specimens and seed of many species and varieties of *Rhododendrons* and related genera, of lilies, roses and other plants of ornamental as well as of scientific interest.

The second and third expeditions, which were carried on during 1935-36 and 1938-39, under my direction, worked principally in Peru, Bolivia, Chile and Argentina. A total of ten North American botanists and assistants and three local botanists and collectors worked for almost one hundred man months along both flanks of the Andes, on the adjacent West Coast, in the Argentine pampa and in Patagonia to Magellan Strait.

The primary objective of these two South American plant hunting expeditions was the collection and study of native species of *Nicotiana* and the related genera *Petunia*, *Salpiglossis*, *Fabiana*, *Nierembergia* and

Bouchetia, and mapping the distribution of *Nicotiana* species, many of which are peculiar to temperate South America. In addition, general collections were made of the more important elements of the various floras which we encountered and a special effort was made to find in these floras new or little known plants of potential ornamental importance. A number of commissions from research institutions and from botanists interested in the vegetation of South America were undertaken. For the Division of Plant Exploration and Introduction, Bureau of Plant Industry, of which a number of members of the expeditions were appointed Collaborators, we collected native and cultivated races of tobacco, cotton, corn and potatoes.

All three plant hunting expeditions sent out by the University of California were financed almost entirely from funds donated by scientific foundations in this country, in England and in South America, by private individuals, by horticultural organizations and particularly California Garden Clubs, Inc. in the case of the second South American expedition. Valuable assistance in propagating, establishing and studying in the University of California Botanical Garden the plant introductions from Asia and from South America is being received from the personnel of Work Projects Administration under O. P. 65-1-08-91 Unit B-3.

I am glad to have this opportunity to make special mention and grateful acknowledgment of the financial assistance provided by the American Amaryllis Society. Such material aid, but of equal importance the approval and encouragement which such aid connotes, is extremely heartening to those who adventure far afield in the hope of securing new or otherwise valuable plant material. It helps to sustain them when after long contact with unfamiliar, often dangerous and inevitably trying environmental conditions they begin to wonder whether all the discomforts and privations of mind and body which they must endure are really justified. In plant hunting in difficult and isolated areas the psychological hazard is often almost as great as the physical one. Under such circumstances to keep in mind the interest which such a representative organization as the American Amaryllis Society will take in the success of your work is very definitely helpful.

The two South American expeditions were eminently successful in the amount and variety of the scientific information obtained. Over one hundred thousand herbarium specimens were collected along with seed of those many species which investigators in this country and abroad were anxious to secure. Of ornamentals, thousands of bulbs, roots, cuttings and seeds were sent back for trial in the University of California Botanical Garden. Such an unexpectedly large amount of valuable material of proved or potential ornamental importance was secured from what has proved to be the most extensive plant exploration ever undertaken in temperate South America, that not sufficient funds are available to permit the propagation of more than a part of it and the necessary testing for worth and the essential selection for quality which we alone can successfully carry on.



T. H. Goodspeed, Berkeley, Calif.

See pages 21, 24

Upper, Placea sp., in its native habitat; lower, Crocopsis fulgens.

Amaryllids often had a prominent share in making attractive the landscape of those considerable portions of Peru and Chile which members of the South American expedition traversed. In the following list of the species which have bloomed or are about to bloom in the Botanical Garden in Berkeley it will be noted that a number were originally collected in the Andes of southeastern Peru in the Deptos. Cuzco, Apurimac and Puno. Scenically this is a magnificent area. In terms of vegetation it is one of the most diversified and important regions of temperate South America. Various members of our expeditions spent a total of five man months in this portion of the Andes and made significant discoveries of new or little known species in a wide range of plant families.

Cuzco, the ancient capital of the Inca Empire, is a most colorful city which is one-fourth modern, one-half Spanish-Colonial, and one-fourth Inca in architecture and still represents as it did of old, the "Hub of the Universe" for the rather primitive descendants of the Incas. With their loaded llamas they constantly throng Cuzco's narrow streets and make them gay with brilliant native costumes. Lying at an altitude of almost 12,000 feet and in sight of the snowy Cordillera, its climate would be rigorous were it not that the equator is only some 13 degrees away. Tender species grow there successfully, even the graceful "banana palm" only requires protection from the strong, cool winds which blow down into Cuzco gardens from the nearby highlands. The rainy season begins in November and lasts for three months or more but showers may be expected at other seasons in the nearby river valleys at lower altitudes.

Cuzco is the most convenient headquarters for the botanist in southeastern Peru. Radiating from it passable automobile roads lead in a number of directions and put the collector within striking distance of almost completely unbotanized areas. At the end of the road the automobile is replaced by horses, burros and llamas but ultimately a lot of hard climbing on foot is involved.

Less than a day's journey from Cuzco is the "Grand Canyon" of the Rie Urubamba whose nearby source is less than one hundred and fifty miles from the shores of the Pacific but whose waters after mingling with other confluent rivers to create the mighty Amazon, flow eastward ultimately to become a part of the Atlantic. In the bottom of the gorge at altitudes of six to seven thousand feet, the banks of the swift flowing river are clothed with a tropical rainforest, which is also characteristic of most equally low altitudes in Peru in areas which lie east of the maritime Cordillera. Through the rare openings in the dense, dark riverside vegetation there are glimpses of almost vertical canyon walls which extend upward to altitudes of ten to fourteen thousand feet and above the high ridges the glittering white peaks and great snow fields of the eighteen to twenty thousand foot crest of the Cordillera stand out vividly against the hard, burnished blue of the Andean sky.

On the steep canyon walls the vegetation, which constantly changes as it ranges upward, shows a remarkably clean cut altitudinal zonation. Thus, a series of species of such a solanaceous genus as *Nicotiana* are found in broad horizontal strips, each one separated from its neighbor

by an altitudunal difference of from five hundred to one thousand feet. In the shady tropical forest at the bottom there are epiphytic orchids while a thousand feet above there are terrestrial ones growing vigorously on rocky outcroppings in full sun or perhaps, in the partial shade of a giant *Calceolaria* whose great golden "pocketbooks" hang five to ten feet above your head from the branches of a massive, pyramidal inflorescence. Still higher, from ten thousand to twelve thousand feet, we found such Amaryllids as *Eustephia coccinea*, *Crocopsis fulgens*, (Plate 169) *Urceolina peruviana*, and others still undetermined. They grew always in well drained situations and mostly either partially shaded or where grasses or low shrubs protected the soil from the intense isolation of the high altitudes.

South and east of the Cuzco region begins the high plateau region, or *puna*, scantily clothed with coarse grasses and dotted with such "vegetable sheep" as *Azorella*, or mound-like aggregations of white cacti. In the midst of the *puna* lies Lake Titicaca, which, with its shore line at an altitude of twelve thousand feet, is said to be the highest large body of water on the earth's surface as it certainly is one of the most beautiful with its blue waters reflecting the snowy crests of the Bolivian Andes. To certain of its islands is assigned the legendary place of origin of the Inca race, the ruins of whose marvellous agricultural terraces rise tier on tier up the island's hillsides. High above the lake's surface, among these evidences of an ancient civilization on Isla Estebes, we found a splendid *Stenomesson*, possible a variety of *S. incarnatum*. On the *puna* almost hidden by the spring luxuriance of *ichu* and other grasses, *Zephyranthes parvula* made the most of the short growing season at thirteen thousand feet. North of Lake Titicaca where the elevated plateaus dip down along river gorges into the Amazonian forest grows a striking *Amaryllis* (*syn. Hippeastrum*) that we have not as yet identified.

On the western foothills of the first or maritime Cordillera in central Peru we found other amaryllids. In October a green leaf or two appeared here and there on the rocky hillsides and constituted, apart from the ubiquitous cacti, the only evidence that plant life existed in such arid terrain. But when the light Andean foothill rains began to fall in April, then suddenly the surfaces of the rough, barren slopes were alive with splashes of color from red, orange and yellow flowers borne on flowering shoots which came from bulbs deep seated under the rocks and boulders. The labor of digging out these bulbs was severe but a fair representation of species was secured. Since they were taken at the dormant season and have not yet flowered in Berkeley they cannot be reported by name or commented upon as to ornamental value at this time.

In terms of ornamentals Chile means to me primarily *Alstroemeria*, although we found there other genera of attractive amaryllids and a host of fine species of trees, shrubs and herbs of many other families. Of *Alstroemeria* we made many collections over a distance of six hundred miles along the coast of middle Chile and also at a number of points in

the *Cordillera de la Costa* behind it and in the Chilean Andes. One was an annual, a little, not too vigorous plant which grew on dry, gravelly slopes of coastal hills while another pushed up six feet high with massive umbels topping thick, almost woody flowering stems. The flower color range was amazing and in the soft clear atmosphere of the Prov. Valparaíso, truly a "Vale of Paradise", pastel shades seemed to predominate. The prize among the *Alstroemerias* was *A. violacea* (Plate 170), of which for a time we despaired of getting seed.

One of the problems of the plant hunter is to time his visit to an important collection region sufficiently accurately so that he will find most of the vegetation just going out of flower. Then he can make selection of what appears to be new or otherwise interesting, scientifically or from the ornamental view point, on the basis of floral and vegetative characters and at the same time be able also to collect seed or other propagative material of his selections.

Working south along the Chilean coast with the advancing spring season we came upon *Alstroemeria violacea* in all the glory of its first flowering. Regretting the absence of seed the collecting party had to push on southward to keep pace with the spring vegetation. Later on, when we judged that seed should be ripe in the area where we had found *A. violacea* and other important plants, we retraced our steps by aeroplane. Although we had judged the season correctly in the case of other plants the capsules on *A. violacea* were still greener than we liked. There was, however, nothing to do but make the best of it by collecting the immature seed in quantity and fortunately a little seed of this most charming *Alstroemeria* ripened in the immature capsules during their trip to California.

In the mistaken impression that we could dig *Alstroemeria* without too serious injury to the tubers and their important buds we spent many back-breaking hours in the Chilean hillsides with pick and shovel. Of more than a thousand plants sent back to California only a dozen or two survived. It is almost impossible to extract from rather heavy soil the large ramifying tuber mass, that is produced by a mature plant of *Alstroemeria*, without considerable breakage of the tissues. These wounded tissues mould very rapidly and after five or six weeks in transit we had almost nothing to show for all our labor. In Berkeley most of the species of which we were able to collect seed begin to bloom in about eighteen months after sowing. Grown in a very light soil in wooden or paper pots they can be transferred to permanent garden locations without injury or retardation of growth.

The *Alstroemerias* of high altitudes in the Chilean Andes are very attractive but will doubtless be difficult to grow except where artificial scree kept at proper moisture content can be supplied. Along the Transandine Railway at altitudes of approximately twelve thousand feet a dark maroon flowered species, whose fleshy spatulate leaves formed a rosette on the surfaces of precipitous rock slides, was never in fruit during my three periods of collecting in that region. Repeated efforts to induce the proprietor of the somewhat primitive hotel at Portillos, the



T. H. Goodspeed, Berkeley, Calif.

See pages 22, 25, 30

Alstroemeria violacea

station just before the entrance to the tunnel which pierces the Andean crest and through which the train passes under the Argentine border, to collect seed later in the season were unsuccessful.

A few thousand feet below the zone in which this high-altitude *Alstroemeria* is found, a species of *Placea* began to appear in some quantity. On sandy plots between the massive boulders covering all but the steepest slopes which lead upward to what perhaps for many centuries has been the most important transandine pass, red-brown flowering shoots in groups of two to five were topped with large light to dark pink, wide-open-mouthed trumpets. Deceived by the sandy soil surface through which they grew I attempted to dig some of these *Placeas* but found their bulbs wedged in between rocks which were too large and heavy for my collecting pick to loosen. Fortunately at still lower altitudes where the season was more advanced *Placea* was in fruit and I was able to collect ripe seed. On the coastal Cordillera we collected either the same or a related species of *Placea* which is shown in Plate 169.

It is said that the rock scenery along the Transandine Railway is the finest in the world. Certainly the immensity of the Andes is most impressive in this central portion of the Chilean Cordillera. You can stand at eight thousand feet in little valleys beside mountain torrents and let your eyes slowly follow up the sharp edges of bold, rocky ridges and on over tremendous rock slides to the beginnings of the snowfields and still on across them to the peaks which culminate in Mt. Aconcagua fourteen thousand feet above you. From December to February the alpine vegetation of "The Pass" is at its best with a succession of species coming into bloom and rapidly going to seed during the brief alpine growing season.

The aridity of the Peruvian coast is continued down to about 30° S. latitude in Chile and further south rainfall increases rapidly until in Prov. Valdivia it may reach two hundred inches annually. Wherever rain falls in middle Chile there is a definite alternation of wet and dry seasons, the former occurring, of course, in the southern winter. The great range of variation in moisture and altitude in the relatively narrow coastal plain backed by a high mountain range which is Chile, produces a correspondingly varied series of floras in which amaryllids are represented in all regions where climatic conditions are not extreme.

Just as in the case of seeds so in the case of bulbs and tubers it was difficult to find their flowers in fresh condition and at the same time obtain their underground organs sufficiently well matured to be dug and shipped with hope of success in growing them in California. In some instances, as already stated, bulbs were dug of what appeared to be amaryllids but concerning which we knew nothing as to species. In a large number of cases unfortunately, herbarium specimens of amaryllids in flower were secured without seed or bulbs being available. These specimens are of great value as evidence of speciation and distribution but too often they show fine ornamental types of which we brought back nothing more than the dried material. In many cases we were, however, able to secure not only herbarium specimens but also seeds or bulbs.

As yet we have authoritative determinations for only a few of our numerous collections of dried specimens of amaryllids, and in the case of specimens obtained only as seed or bulbs there are many which have not bloomed. Therefore it appears best at the present time to list only those species which have flowered in the University of California Botanical Garden for which we have a determination, either final or approximate, or which appear to possess some special interest. If desired, further reports can be supplied in the future after all our large collection of amaryllids from South America has come into flower and has been adequately studied taxonomically.

In most instances, the species listed below were flowered without the protection of glass or shade in a well drained loam. This lack of protection is no necessary indication of hardiness because during the last two winters we have had only a degree or two of frost in Berkeley and then only for a total of a week or so. Thus we are unable to predict the extent to which the species listed will successfully withstand lower temperatures or more prolonged periods of light frost. However, in some cases the high altitude of their native habitats would suggest a considerable degree of tolerance and hardiness. Among the most important factors in successful cultivation are, of course, adequate drainage and provision for a definite resting period during which water is withheld and the underground reproductive organs are allowed thoroughly to ripen.

SPECIES OF AMARYLLIDACEAE FROM SOUTH AMERICA WHICH
HAVE FLOWERED IN THE UNIVERSITY OF CALIFORNIA
BOTANICAL GARDEN * :

Crocopsis fulgens Pax (36.2047). Bulb elongated, about 1 in. diam. Leaves narrow, linear, 9-10 in. long, $\frac{1}{4}$ -in. wide. Flowers almost sessile, narrowly funnel-form; tube scarlet, 3 in. long and flared to 1 in. at mouth. Collector's notes: "Collected in Peru, Depto. Cuzco, at Tetecacca, 3 km. east of Cuzco in small open valley among rocks, also in shelter of bushes. Alt. 3550 m. Common name: 'Pulla-pulla.'" In its native habitat this species flowers in October but in Berkeley it has flowered in April and June. Sometimes the stemless flowers appear previous to or just with the foliage. Requires sharp drainage. (See Plate 168).

Eustephia coccinea Cav. (36.2048). Bulbs ovoid, about 1 in. diam. Leaves bright green, narrowly linear, 8-10 in. long, about $\frac{1}{3}$ -in. wide. Flowers produced on a 2-edge scape 9-12 in. high, 4-5 flowers to a scape; flowers pendant, tubular, about $1\frac{1}{4}$ in. long, and $\frac{1}{2}$ -in. wide at mouth of tube; tube dull crimson and slightly recurved, segments tipped greenish yellow. Collector's notes: "Collected in Peru, Depto. Cuzco, Prov. Calca, near Pisacc; habitat various, but usually in rocky ground. Alt. 3000-3500 m. Hardy." This species is apparently quite common

* Numbers in parentheses refer to accession numbers in the University of California Botanical Garden.

in this locality and flowers in September. In Berkeley the flowers appear in April and May.

Eustephia? (36.1006). Bulb ovoid, 1 in. diam. Leaves narrowly linear, 8-10 in. long, $\frac{1}{3}$ -in. wide, recurved at tips. Scape 12-15 in. high, 4-5 flowers to a scape. Flowers tubular and pendant, $1\frac{1}{4}$ in. long and $\frac{1}{3}$ -in. wide, deep crimson with green-tipped segments. Very similar in appearance to No. 36.2048, but differs primarily in that the tips of the segments do not flare outward. Bulbs only collected.

Amaryllis (syn. *Hippeastrum*) *advenum* Herb. (36.1174). Bulb ovoid, 1- $1\frac{1}{2}$ in. diam. Foliage narrowly linear, 8 in. long, $\frac{1}{4}$ -in. wide. Scape 12 in. high; flowers 4-5, enclosed in persistent papery bracts which are $1\frac{1}{2}$ -2 in. long. Flowers funnel-shaped, apricot yellow, $1\frac{1}{2}$ -2 in. long and $\frac{1}{2}$ - $\frac{3}{4}$ -in. wide at mouth. Collector's notes: "Collected in Chile, Prov. Valparaiso, between Puchuncavi and Matitencillo, on road Viña del Mar to Zapallar; fields and pastures near coast. Alt. 25 m." Blooms usually around December in Chile; specimens in Berkeley have bloomed in May, and in September.

Amaryllis (syn. *Hippeastrum*) *sp.* (39.1038). Bulb globose, 2-3 in. diam. Leaves linear, 12-24 in. long, $\frac{3}{4}$ -1 in. wide, appearing with flowers. Inflorescence a scape 18-20 in. high. Two flowers to the scape, which open at right angles to stem on 2-in. pedicels. Flowers enclosed by two leafy green bracts $2\frac{1}{2}$ in. long by 1 in. wide. Perianth segments $4\frac{1}{2}$ in. long and $1\frac{1}{2}$ in. wide at broadest part. Interior of segments checkered blood red, exterior of segments with broad green stripe. Interior base of segments light green with clusters of fleshy glandular hairs at base of stamens. Stamens as long as petals, anthers yellow, stigma slightly trifid, $\frac{1}{4}$ -in. longer than stamens. Collector's notes: "Collected in Peru, Depto. Puno, Prov. Sandia. Hillsides of Huancarani, 5 km. from Limbani; near water in rocky, sandy soil. Alt. 3000 m."

Amaryllis (syn. *Hippeastrum*) (*bicolor?*) (38.1082). Bulbs globose, black-coated, 2 in. diam. Foliage linear, 12 in. long, $\frac{1}{2}$ -in. wide. Scape to 18 in. high with 4-5 flowers to the umbel. Flowers ascending, narrowly funnel-shaped, tube 2 in. long, segments red, tips yellowish green, $\frac{1}{4}$ in. wide at the mouth. Collected as bulbs, Chile, Prov. Coquimbo, near Vicuña. Bloomed in Berkeley in July, 1939.

Amaryllis (syn. *Hippeastrum*) *sp.* (36.1219). Bulb pyriform, about 2 in. diam., with blackish brown membranous coat. Foliage glaucous, linear, 1 ft. long. Scape 15 in. high, 6 blooms to inflorescence, pedicels $1\frac{1}{2}$ in. long. Flowers coral-pink to rose-pink, funnel-shaped, 2 in. long, 2- $2\frac{1}{2}$ in. wide at mouth. Collector's notes: "Collected in Chile, Prov. Cautin, near Las Paraguas Sawmill, west foot of Volcan Llaima, 20 km. east of Cherquenco, among hard grasses, in moor-like formation, slaty soil. Alt. 2000 m." Flowers in Chile during December, but in Berkeley during May and June.

Urceolina peruviana (Presl) Macbride (36.1041). Bulb globose, 1 in. diam. Leaves 1-2, shortly petiolate, linear, lanceolate, about 9-12 in. long, 1- $2\frac{1}{2}$ in. wide, light green below with prominent midrib, glossy green above. Scape to 12 in. high. Flowers pendant on 1-2 in.



T. H. Goodspeed, Berkeley, Calif.

Astroemeria Hookeriana in its native habitat.

See page 30

pedicels; perianth tube $1\frac{1}{4}$ in. long, deep orange, dilated in the upper third; constricted above the segment tubes which are slightly flared, giving the flower an urn-shaped appearance. Collector's notes: "Collected in Peru, Depto. Apurimac, 6 km. south of Chincheros on trail to Andahuaylas; trailside banks under shrubs. Alt. 3300 m." Bulbs were in bloom in November in their native habitat and have bloomed in Berkeley during the months of September, October and November and, in some instances, in April and May. This species does better in partial shade at Berkeley.

Stenomesson (incarnatum?) (39.1042). Bulb globose, 2-3 in. diam. Leaves erect, linear, 12-18 in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. wide, light green, contemporary with flowers. Scape solid, slightly flattened, two edged, 91 cm. long, .8 cm. wide; spathes 4, two 5.3 cm. long, 1.9 cm. wide, two 4.9 cm. long, 1.3 cm. wide; bracts 4; flowers 6; pedicels 1.2 cm. long; ovary 1.4 cm. long, 6 mm. wide; perigone (perianth) curved, pendulous, resembling a typical *Cyrtanthus*, 9.5 cm. long; tube 7 cm. long, 4 mm. wide at base, 1.5 cm. wide at throat; segments 2.5 cm. long, 1.3 cm. wide; color effect in mass Azalea Pink (RHS 618), tube and outside of segments Azalea Pink, prominent green markings on segments, .4 mm. to .5 mm. wide and tapering to a point at apex, inside of segments light Azalea Pink, whitish band .3 mm. to .4 mm. wide, in center light green stripe on each side; stamens 8 mm. long. inserted at edge of throat, united into a very short staminal cup, with bifid teeth between the stamens; style white, stigma capitate tinged with light Azalea Pink, style exerted 1 cm. or more beyond segments. Collector's notes: "Collected in Peru, Depto. Puno, Isla Estebes, Lake Titicaca; on calcareous rocky slope. Alt. 3840 m. Common name in Cuzco: 'Mayhua.' " Flowers in Cuzco until January. Has bloomed at Berkeley in April and May also in November. A very attractive species, requiring partial shade in Berkeley.

Stenomesson (Piercei?) (38.1071). Bulbs ovoid, 2 in. diam. Leaves lanceolate, 10-18 in. long, 1- $1\frac{1}{2}$ in. wide, glaucous below with prominent midrib. Scape 18-24 in. high, flowers pendant, 6 or more to umbel on 3-in. pedicels. Tube funnel-shaped, $1\frac{1}{2}$ in. long, pale greenish yellow with ends of segments tipped green, $\frac{1}{2}$ -1 in. wide at the mouth. Collected as bulbs in Peru, at Sacsahuaman, Depto. and Prov. Cuzco. Not a very ornamental species.

Ismene (amancaes?) (39.1027). Bulb globose, $1\frac{1}{2}$ in. diam. Leaves 4-5, superposed, suberect, 12 in. long, $1\frac{1}{2}$ in. broad. Peduncle ancipitous, 15 in. high. Flowers 2-5, pale yellow, fragrant. Collector's notes: "Collected in Peru, Depto. Apurimac, Prov. Abancay, Hacienda Trancapata, Curahuasi; on cultivated lands. Alt. 2800 m. Common name: 'Amanckai.' "

Bomarea Bridgesiana Beauverd? (36.1295). Large, thickened, fibrous roots. Stem to 8 ft., stout ($\frac{1}{2}$ -in. diam.), sub-erect. Leaves lanceolate, light green, 4 in. long, $\frac{1}{2}$ -in. wide. Inflorescence an umbel of 10-15 flowers enclosed by numerous broad, leafy bracts. Perianth tube 2 in. long, $\frac{3}{4}$ -in. wide, light green. A very strong growing species

and, while not too attractive, may prove to be an admirable parent for hybridization, possibly with *Bomarea Caldasiana*. Collector's notes: "Collected in Peru, Depto. Cuzco, Ruins of Quenceco at Cuzco; among rocks. Hardy, non-climbing. Alt. 3600 m." In Berkeley, flowers in June, July and August.

Bomarea sp. (36.1376). Root system, thickened fibers. Stems slender and twining to 4 ft. high. Leaves alternate petiolate, lanceolate, 2-2½ in. long, ¼-½ in. wide, glabrous and green above, glaucous below. Inflorescence a compound umbel, rays ⅓ in. long, each ray about 3 flowers. Perianth segments equal in length, 1 in. long; flowers tubular, purplish red, segments tipped green. Collector's notes: "Collected Chile, Prov. Valparaiso, southwest slope of Campana de Quillota; semi-arid brushland, climbing among shrubs. Alt. 1000 m."

Zephyranthes parvula Killip (36.1155). Bulb globose, ½-in. diam. Leaves narrowly linear, 2-3 in. long and ⅛-in. wide. Flowers, which appear before the leaves, are barely 1 in. long. Perianth tube ½-in. long segments spreading from 1 to 1½ in. across, white in the interior, exterior of the segments purplish. Collector's notes: "Collected in Peru, Prov. Melgar, Depto. Puno, at Granja Modelo de Chuquibambilla; among grasses on pampa. Alt. 3914 m." Bloomed in Berkeley in July. Requires full sun and should be at home in the rock garden.

Zephyranthes sp. (39.2492). Bulb globose, 1-1½ in. diam. Leaves narrowly linear, 9 in. long, ¼-in. wide. Peduncle to 10 in. high. Flowers large, funnel-shaped, bright yellow, 3 in. long, 2 in. wide at mouth. An excellent and showy species. Bloomed at Berkeley in September and October. Collector's notes: "Collected in Peru in cotton fields near Molina Experiment Station near Lima; open fields in rich soil, fair amount of moisture. Alt. ca. 80 m."

Alstroemeria recumbens Herbert (36.1188). A low growing species with very short vegetative stems. Flowering stems attain a height of from 9-12 in. The inflorescence is an open compound umbel, 4-7 rayed. The interior of perianth segments are light lavender pink, flushed maroon, with deep maroon tips. Upper lobes striped maroon, tips marked with yellow—a very odd combination of color. This species apparently requires a little shade and certainly resents too much water. Flowered from April until August in the Botanical Garden at Berkeley. Collector's notes: "Collected in Chile, Prov. Valparaiso, near Monte Mar, on road from Viña del Mar to Concon; flat tops of headlands near beach, in sand. Alt. 5 m. Associated with *Carpobrotus chilensis*."

Alstroemeria violacea Phil. (39.1615). This is probably the first introduction into cultivation of this fine species. Mature plants attain a height of 5 ft. and are found growing on the edge of the Atacama desert in Chile at altitudes of 500-1500 ft. The leaves on the sterile stems are ovate-oblong, 2 in. long, 1 in. wide, and shine as though lacquered. The flowering stems eventually reach a height of 5 ft. and produce a compound umbel, 6- to 8-rayed with as many as 16 blossoms to the inflorescence. The flowers are a pleasing shade of Mauve (R.H.S. Color Chart 633/2), 2¼-in. wide at the mouth, each segment being

1½-in. long. The lower half of the upper segments white with scattered carmine spots. This species has responded to the same cultural treatment as other *Alstroemerias*. The blossoms first appeared in June, approximately five months after germination, and continued to appear until late August. (See Plate 170.)

Alstroemeria sp. (36.1215). Closely resembles *A. ligtu* in growth, habit, and floral characters. The umbel is compound, 6-rayed, with 6 flowers to each ray. The individual blossoms are slightly smaller than the largest of the "Ligtu-Angustifolia" hybrids of Constable, and are a striking shade of salmon red. The lower segments are slightly longer than the upper, and tipped yellow with maroon stripes. A peculiar situation exists in the stamens, the anthers of which dehisce or abort about the time when the flower is opening although in some instances, one stamen elongates to produce a large normal anther close to the exerted stigma. This species appears to have sixteen pairs of chromosomes as compared with eight pairs in other species of *Alstroemeria* which have been examined. Its flowering period is later than other species, commencing in June and continuing through August.

Alstroemeria sp. (36.1343). Dwarf species with vegetative shoots barely 2 in. high. Requires some shade and careful watering. Inflorescence attains a height of 12 in., bearing a compound 7- to 9-rayed umbel which is quite large for the size of the plant. The individual flowers are crimson (R.H.S. Color Chart 22/2). Upper lobes with long and darker stripes. An excellent color shade and should be good color parent. In cultivation has maintained its dwarf habit for three years. Collector's notes: "Collected in Chile, Tumbes Peninsula, Concepcion Bay, 10 km. north of Talcahuano; coastal bluffs, west shore of bay. Alt. 15-50 m." In Berkeley this species usually blooms from May until the beginning of August.

Phaedranassa sp. From a correspondent in Costa Rica we have obtained bulbs that were sent in as *Chaemaloe costaricensis* (37.407). Bulbs globose, 2 in. diam. Leaves 1-2, erect, oblong, lanceolate, 18 in. long, 2½ in. wide at center, glaucous green below with prominent midrib. Peduncle 2 ft. high, flowers 6-8 in the umbel. Perianth tube pendant, 2 in. long, bright red, tipped green. In Berkeley it blooms during October and November.

* * * * *

Of *Alstroemeria* between twelve and fifteen seed collections from the wild have not yet bloomed. I am especially interested in seeing *A. Hookeriana* (Plate 171), collected in the Cordillera de la Costa in middle Chile. On the basis of evidence from herbarium specimens we should soon see the flowers of a number of other new or little known species of *Alstroemeria*. In addition we have grown a few special selections which originally came as seed from cultivation in Europe and South America. Of these, three are worthy of mention. First a race which represents a variant of *A. aurantiaca* (36.1814) with an original color range from light yellow to deep orange from which we have secured

better colors than those ordinarily in the trade. Second, a strong growing variant of *A. ligtu* (38.2095). The flowering shoots are 2½ to 3 feet high bearing an open compound 6- to 10-rayed umbel. The flowers, on 3-inch pedicels, are light to dark orange-red, the tips of the upper segments yellow with maroon stripes. It is a sturdy variety which blooms with us from May until August. Third (38.2096), a race similar in habit to the preceding but with a more compact 9- to 12-rayed umbel, the flowers borne on larger pedicels. The flower color is Geranium Lake flushed with orange and the tips of the segments are dark maroon.

We have seedlings of ten or more *Amaryllis* (syn. *Hippeastrum*) which include *A. graciliflorum* and *A. Bagnoldii*, among species already determined. Concerning others the herbarium specimens and collectors' notes indicate that a number will have special interest. The species of *Placea* shown in Plate 169 has not yet bloomed for us.

Of *Bomarea* and related genera we have approximately fifteen collections which will flower in 1941, among them *B. ovata*, *B. nematocaulon* and *B. Fiebrigiana*. Bulbs of *Stenomesson Flavum* (?) were received some time ago and should bloom next Spring. In addition we are growing a number of other species of *Stenomesson*.

Of collections from South America which were tentatively labeled by the collectors as Amaryllidaceae we are growing twenty or more and additional collections of similarly undetermined seeds, tubers and bulbs are constantly being received from correspondents in Peru and Chile.

CARL PURDY, PIONEER CALIFORNIA HORTICULTURIST AND LANDSCAPE ARTIST

Mr. Carl Purdy received the Herbert Medal in 1939, and a portrait with short autobiography appeared in 1939 *Herbertia*. This was a mere sketch, and was not as complete as desired. Through the good offices of Mr. Frank Leach, Piedmont, California, who handled the necessary correspondence, this short statement is here supplemented by the testimony of four distinguished Californians.

The officers and members of the Society are of the opinion that amaryllids, roses, orchids, and other choice floral tributes should be distributed while the recipients are still with us to enjoy the friendship and appreciation that they represent. In accordance with this policy, we are honored to present the symposium on Carl Purdy by these distinguished Californians.—*Hamilton P. Traub; Wyndham Hayward.*

CARL PURDY: LOVER OF THE NATIVE PLANT LIFE

WILLIS LINN JEPSON,

Department of Botany, University of California, Berkeley

If the full story of Carl Purdy's quests in the mountains and valleys of California in search of native plants and the cultural history of his work with them could be told, it would make a saga of surpassing

interest. Nature, in the full exuberance of indigenous plant life in pioneer days, provided in his native County of Mendocino a fitting environment for his beginnings. He grew up in the small town of Ukiah with little formal education beyond the grammar school. Doubtless his interest in the flowering plants dated from an early age when he began to collect and cultivate them. His interest in this work developed to such a degree that finally as a young man he gave up a livable job in the town in order to devote himself wholly to his real love, the lilies. Concurrently he felt certain defects of education and began to study botanical science and the Latin language. In this manner he found the way, not merely to organize and make effective the knowledge which he already possessed, but thereby to expand continually the horizon of his interests and to offer the results of his work to the public in printed form.

Some of his articles are serious scientific contributions, such as his "Revision of the Genus *Calochortus*" published in volume three, third series of the Proceedings of the California Academy of Sciences in 1901, his "Notes on Liliaceae" published in the journal *Zoe*, volume one, in 1890, and his "Lilies of the Western United States and British Columbia" which appeared in the Journal of the Royal Horticultural Society, London, volume twenty-six, in 1904. In addition, he has written numerous articles of a more popular nature for horticultural or garden journals. His papers on various phases of the California vegetation, which appeared in *Garden and Forest* forty-five years ago, contain much valuable ecological matter and are still meaty reading.

During the course of the years he has often talked informally but most effectively before conventions or clubs interested in horticulture. One afternoon long ago he was invited to a large drawing room in San Francisco. The introduction of the chairman of the meeting was couched in such effusive terms of extravagant praise that nearly every one in the gathering felt embarrassed. Mr. Purdy was undisturbed. He stood quietly until the orator had finished, inclined his head slightly towards him and uttered one word, "Ditto". The gathering laughed, every one once more felt at ease, and Mr. Purdy plunged at once into that which he had to say about plant culture. His talks were always well-prepared, orderly and interesting.

The natural powers of his mind are very great and have been continually strengthened and deepened by continuous thought and study. His knowledge of the life-history of the native Liliaceae and many other groups is unsurpassed. Serene of mind, resourceful of intellect, gifted with exceptional fortitude and unusual powers of perseverance, his achievements in his chosen field are notable. Moreover, he has passed on to others in full volume his great enjoyment of life and nature in the out-of-doors in California.

CARL PURDY: THE GARDEN DESIGNER

KATHERINE D. JONES,

Agricultural Hall, University of California, Berkeley

My earliest contact with Mr. Purdy was when I was teaching Agricultural Education under Professor Ernest Babcock and sending out seeds to the High Schools of our state, California. This was from 1910 to 1913, but my contact with Mr. Purdy did not cease when I was transferred to the new Landscape Design Department, which was established in 1913. We had school gardens during the term time and courses for teachers during summer vacations when again they had school gardens.

Mr. Purdy at that time was doing some interesting work on some of the estates about the San Francisco Bay region, sent us catalogues for our classes which were highly artistic and gave us cultural directions which he had prepared with special thought for our group as well as for his increasing number of clients. He was experimenting in naturalizing bulbs on barren hillsides, in studying succession of bloom in hardy border and in planting "little corners" in favored spots or on prominent portions of grounds that were much in the public eye. He gave us evening lectures to illustrate some of these plans which he had already planted out and we afterwards visited such gardens with our students to study the finished product.

As examples, Blue Dick, *Brodiaea capitata*, had been planted 6 to 12 inches apart in the grass. Camass Plant, *Camassia Leichtlinii*, planted 3 to 4 inches deep in the fall both in sun and shade. Dog-tooth Violets, *Erythroniums*, in shade on a north slope a foot apart. Checker Lily, *Fritillaria lanceolata*, in the shade of oak trees on a north slope, a foot apart.

All this was most stimulating and created great interest in the several experiments. People flocked to his lectures and went home to make plans and to plant.

CARL PURDY

ALICE EASTWOOD,

California Academy of Sciences, San Francisco

Carl Purdy is known wherever California plants belonging to the Lily Family can be grown. For many years he has distributed the bulbs of these lovely plants to all parts of the world where an interest in flower and gardens exists. Probably no other person knows these lily plants so intimately as he. He has seen them growing where they are native and in his own garden. All their variations are familiar to him.

His chief botanical paper was a revision of *Calochortus* which was published in the Proceedings of the California Academy of Sciences in

1901, Vol. III, series 2. In this he named the following species: *Calochortus amabilis*, *C. Lobbii*, *C. shastensis*, *C. concolor*, *C. Dunnii*, *C. Vesta* and the following varieties of *Calochortus venustus*, namely: *eldorado*, *roseus*, *suphrureus*.

Calochortus obispoensis was published by him in Bot. Gaz. XI: 180 (1886). Two lilies were named by him: *Lilium occidentale* in Erythea V: 103 (1897); and *Lilium Kelloggii* in one of his early catalogues. These two lilies have recently been beautifully illustrated in Supplement of Elwes Monograph of the Genus *Lilium*. The plates are folio and colored. He published *Erythronium Californicum* in Flora & Silva 11: 253 (1904). *Iris Watsonia* was published in Erythea V: 128 (1897).

It has been a privilege and a pleasure to have named the following in his honor: *Calochortus Purdyi*,¹ *Fritillaria Purdyi*,² *Iris Purdyi*³ and *Allium Purdyi*.⁴ *Sedum Purdyi* was named by Dr. Jepson in Flora of California 11: 110 (1936).

His knowledge of the natural environment of many other kinds of California plants has been required in helping to restore the native vegetation, both by seeds and trans-planted plants, in places where it had been destroyed. The talks that he gives to Garden Clubs are informal and delightful, no "hifalutin" style but just homely talks that everyone can understand. He is a man of a simple, honest nature such as is not rare among plant and garden lovers.

CARL PURDY: PIONEERED CALIFORNIA NATIVES FOR THE HOME GARDEN

GEORGE B. FURNISS,

Charter Member, California Botanical Society

Mr. Purdy was the first to send California native bulbs and wild flower seed to Europe in quantity and became the source for supply for many famed dealers abroad. His sheer love for plant life and nature, led him into remote and unknown parts of virgin country. Venturesome and observing, he gained intimate knowledge of California's vast flora. He commercialized his zeal that he might carry on and share with others the joy of his quests. Prices became modest carrying charges and again he ventured first where few followed: "*Post paid to your door*".

His catalogues are intriguing and unique, combining botany and horticulture. His language is remarkable for both clarity and brevity; informative as to description, habit and culture and carries a subtle urge and challenge. His recognition is attested by the frequency he is quoted; generally verbatim. He has been consultant and referee for western botanists.

The year 1915 was a detour. Bertram Farr displayed at the San Francisco Panama-Pacific Exposition, the first of the newer German

¹ Proc. Calif. Acad. 111. 1: 137 pl. 11, (1898)

² Bull. Tor. Club XXIX, 79, Pl. 6, (1902)

³ Proc. Calif. Acad. 11. 1: 78, pl 7 (1897)

⁴ Leaflet West Bot. 11. 110, (1938)

iris. Mr. Purdy bought the collection and became the means of starting many of the specialists of today but soon left the hybrid field to others.

He was early to advocate pot culture of certain native bulbs. Such permitted resting the dormant bulb in dryness to correspond with California's rainless summer. This helped popularize bulbs in Europe because Europeans make more use of pot plants in the garden, along walks and steps, than we do and which we might emulate for better effectiveness.

As business grew, it became necessary to train assistants to do collecting with Mr. Purdy's insistence that they also carry on in the conservation of flora by leaving lily scales, offsets, roots or seeds for nature to replenish. He lives within a half hour automobile ride of all that is modern yet his home, in a mountainous section, is still isolated within the charm of the primeval. His writings partake of that verdure and ruggedness of outlook. The great number of plants of merit which he found and named and those named to his credit are also his contribution to botany and horticulture.

HERBERT WILLIAM PUGSLEY

A Biographical Sketch

Herbert William Pugsley was born at Bristol, England, on January 24, 1868. His early education was received at Bristol Grammar School, and later he attended the University of London where he was singled out as University Prizeman, and received the B. A. degree in 1889. In 1896, Mr. Pugsley entered the Admiralty and remained on the staff there until his retirement on pension in 1928. Subsequently he worked voluntarily in the Botanical Department of the Natural History Museum at South Kensington.

Mr. Pugsley has been a lifelong student of systematic botany, particularly Eurasian phanerogams, in available leisure, and has traveled extensively during leave and since retirement over central and western Europe as well as the British Isles.

Mr. Pugsley has carried on consistent and important research on the description and classification of Narcissi, and his work is the most important on this group since the appearance of Baker's Handbook of the Amaryllideae in 1888. More than forty years ago he began to cultivate Narcissi in his garden, and the first report of his studies was an account of the Poeticus group entitled "*Narcissus Poeticus* and its Allies", published as a supplement to the Journal of Botany in 1915. This work covers both the wild and cultivated forms, the latter sometimes of obscure origin. He accomplished what few botanists have even attempted for he has studied the forms that most workers dismiss as synonyms, following the policy inaugurated by Bentham. Even if one does not agree that these forms are all entitled to specific rank, one must agree that the work is very valuable and illuminating for it properly defines the whole group treated. Much more work of this nature should be carried on by systematic botanists if we are to secure some

idea of the evolutionary tendencies in the group. That after all is one of the most important objectives in systematic botany.

In 1933 Mr. Pugsley's "A Monograph of *Narcissus*, Subgenus *Ajax*" appeared in the Journal of the Royal Horticultural Society. This valuable work measures up to the high standard set by his earlier report. It is based on the study of a wealth of living material, both wild and cultivated, in his garden, and also on the field study of plants in their native habitat. As evidence of his continued interest in the *Narcissi*, he published "Notes on Poet's *Narcissi*" in the Journal of Botany in 1937, and "Notes on *Narcissi*", in 1939, in the same periodical.

Mr. Pugsley is specially interested, not only in *Narcissi*, but also in *Fumariaceae*, of which the genera *Fumaria* and *Rupicapnos* were monographed in 1919, *Euphrasia* (Monograph of British species in 1930), *Dactylorhiza* (revised in 1935), *Saxifraga*, sect. *Robertsonia* (revised in 1936) and *Hieracium*, of which a monograph of British forms is in the course of preparation. He has also described many new species and varieties of plants, and he is a constant contributor to the British "Journal of Botany" since 1900. He has taken an active interest in the Wild Plant Conservation Board, a branch of the Society for the Protection of Rural England.

Apart from botany, Mr. Pugsley is interested in art, and is a collector of English water-colour drawings.

In recognition of Mr. Pugsley's important contributions to the systematic botany of the *Narcissi*, and in recognition of his sterling character, the Society is honored to bestow upon him (Plate 172) the William Herbert Medal for 1940. It is handed to him with the congratulations of all the members.

*U. S. Horticultural Station,
Beltsville, Maryland*

—*Hamilton P. Traub*

IN MEMORIAM—GEORGE DE WITT KELSO

WYNDHAM HAYWARD, *Florida*

George DeWitt Kelso was born April 9, 1867 at Newburgh, New York. He lived on a farm and attended local schools until he reached the age of about 15 years. Later he was a student at Mt. Hermon School, Mt. Hermon, Massachusetts, and from there he entered Rutgers College at New Brunswick, New Jersey, graduating with the Class of 1892. Following graduation, he was in the insurance business for some years. He moved to Rhode Island in 1902, and about 1910 he entered hospital work, and for many years owned and managed the Surgical Clinic in Providence, Rhode Island.

Since 1909 Mr. Kelso had lived in the country traveling to and from the city daily. On his country estate he indulged his love for flowers and his other hobby—photography. *Hemerocallis* claimed his attention several years ago, and it gave him real delight to visit his



Herbert William Pugsley

garden each morning and evening to note the new blooms, and when failing health prevented him from even that mild exercise, the blooms were brought in for his inspection. The friendly letters received from those similarly interested were a source of genuine pleasure to him. He spent much of his time on the daylily evaluation work, a field in which he was the only pioneer, and completed that for the season 1939 only



Fig. 46. George DeWitt Kelso, 1867-1940

a few days before his death on February 8, 1940. His final report on daylily evaluation appears in this issue of *Herbertia*.

Mr. Kelso was in charge of the daylily experimental display garden at Roger Williams Park, Providence, Rhode Island, where he tried out many daylily clones and species received by donation, exchange and purchase from all parts of this country and Europe. In his daylily evaluation work he cooperated with Professors George D. Graves and H. S. Tiffany of the Massachusetts State Agricultural Experiment

Station, and officers and members of the American Amaryllis Society who encouraged him, and published his daylily evaluation reports in *Herbertia*.

EXCERPTS FROM LETTER FROM MRS. GEORGE DE WITT KELSO

OCTOBER 20, 1940

“I am sending an excellent photo of Mr. Kelso (Fig. 46). * * * *
The idea of a display garden of *Hemerocallis* at Roger Williams Park originated with Mr. Kelso. He was granted a planting space and in 1934 secured about fifty clones. In this he was encouraged and assisted by Dr. A. B. Stout of the New York Botanical Garden. Various nurseries, seedsmen and individuals donated plants, many coming from distant points, even from England. The collection increased to eighty clones, and then due to new greenhouse construction the plants were moved to a new and more favorable location overlooking one of the numerous lakes of the Park. New plants were added until there were about one hundred and twenty-five.

“Mr. Kelso superintended the planting and arrangement of the daylily beds, and made frequent trips to the garden until stricken ill in November 1937. The next summer, 1938, his visits were less numerous, due to illness, although the garden was thriving and the amount of bloom was increasing. However, others interested in daylilies were free to visit the collection and many availed themselves of this opportunity.

“After the month of May, 1939, Mr. Kelso was wholly unable to visit the Park. At home he continued to work on the evaluation records, a work that was of great interest to him until the very end.

“While he was President of the Rhode Island Horticultural Society, Mr. Kelso suggested a display garden of narcissi for Roger Williams Park. The idea was well received, and a very fine display was arranged. Mr. Kelso was also interested in various other flowers. At one time he had a fine collection of dahlias, and a little later peonies claimed his attention, and he continued to enjoy their beauty until his death.

“I wish to thank Prof. H. S. Tiffany of the Massachusetts Agricultural Experiment Station at Waltham, for his kindness in sending out the 1939 symposium results. I am glad to know that the work begun by Mr. Kelso is being ably continued by the Daylily Committee”.

NOTES ON AMARYLLIDS, 1939-1940

ALBERT PAM, *England*

I have been asked by the Editor to contribute an article to *Herbertia*, and I shall do my best to comply with his request. But it will be realized by all members of the A. A. S. that it is a difficult task for us in England at the present critical time to bring ourselves to take interest in, let alone to write about, our plants or our gardens.

The following is a short account of some observations on amaryllids in my gardens during the past year.

Phaedranassa Carmioli. Thanks to the kindness of Mr. Austin Smith, of Zarcero, Costa Rica, I received some bulbs of this species in 1939. When the first of these flowered I found that it corresponded exactly with the description in Baker's Handbook, but when I referred to the plate published in the Botanical Magazine, Tab. 8356 in 1911, it was evident that this did not match my plant at all. I therefore sent a flower to the Royal Botanic Gardens, Kew, and the Director informed me that he quite agreed that the plant figured in Tab. 8356 was not *P. Carmioli*. Sir Arthur Hill wrote me,—“Your plant is certainly different from the one figured in the Botanical Magazine, t. 8356, but it exactly matches the original drawing of this species of Saunders, Ref. Bot. t. 46. The species was first described there, so your plant is correctly named. We are rather puzzled about what Bot. Mag. t. 8356 really represents. It is supposed to have come from Costa Rica, but *P. Carmioli* is the only species known from there. We have actual specimen here, and it agrees well with the plate but looks more like a form of *P. chloracea*.” A new figure has now been prepared based on the material supplied by me and will in due course be published in Bot. Mag.

Zephyranthes Lindleyana Herb. Among the plants collected by Mr. Edward K. Balls in Mexico, his No. B. 4146 flowered here early this year; it agreed with the field specimen sent by Balls under this number, which had been identified by the Herbarium at Kew as this species, but only a flower was sent by Balls and no leaves were included. When, however, the leaves developed on my plants, they were 10 mm. wide, although they are described as “linear” by Herbert and by Baker, and are so shown in plate 35 of Herbert's Amaryllidaceae. I am particularly interested in this species, as both it and *Z. grandiflora* were originally grown in these gardens by my predecessor, Sir Abraham Hume, in 1825 or earlier. Owing to a mistake of the gardener here at that time, Botanical Register tab. 902 shows the flower of *Z. grandiflora* but the leaves of *Z. Lindleyana*; see Herbert (loc.cit) page 174 under *Z. Lindleyana* and page 173 under *Z. carinata*. I fear that we shall now have to wait till this plant flowers again before the puzzle can be cleared up, but in the meantime it would appear that the plant sent by Balls is not *Z. Lindleyana*. B. 4146 seems to be a species very like it in flower but with broad leaves which will, in due course be submitted to Dr. Hume for identification, as Kew has nothing like it in its Herbarium.

Zephyranthes lutrae. Some years ago I was given some bulbs under this name by the New York Botanic Gardens, bearing No. 74986. One of these has flowered this year, but Kew are unable to trace this name, and I should be glad to receive information about this plant. Kew reported that it has some resemblance to the plant known as *Cooperia pedunculata*, but differs in being almost sessile.

Stenomesson flavum. I was glad to flower this species for the first time, as it is a pretty plant. It was sent by Balls under his number

B. 5859, and was probably collected in Peru, although I do not seem to have received the field notes.

Zephyranthes verecunda. This species was collected by Balls in Mexico in a number of localities. It appears to be a very variable species both as to colour of the flower and width of leaf. I have now flowered it under four separate numbers, and each is slightly different.

* * * * *

The past winter has been very cold indeed for this country, and record frosts have been recorded in many parts. In my gardens the lowest temperature was 2 degrees below zero Fahrenheit in the open, and it hovered around zero for several weeks. Yet the amaryllids grown in the open did not suffer, and I have had but few losses. It seems as if established plants can stand very much more cold than we had expected, and I think that it may be worth while for some lovers of this family who live in the more northern States of the U. S. A. to try to grow in their gardens some species which were reputed to be tender. Among the plants which not only survived here but have flowered this year as freely as ever are,—*Amaryllis* (*Hippeastrum*) *pratensis*, *Sprekelia formosissima*; *Amaryllis* (*Hippeastrum*) *Ackermanni*; *Crinum Powellii*, *C. Moorei* & *C. longifolium*; *Alstroemeria Ligtu*, *A. aurantiaca*, *A. chilensis*; *Pancratium illyricum*, in addition of course to all the species generally considered as hardy. The following are untouched by frost and will certainly flower freely in their proper season: *Collicore rosea* (*Amaryllis belladonna*), *Nerine Bowdeni major*, *Hymenocallis festalis* (Mr. Worsley's hybrid), *Lycoris spp.*, and several other alstroemerias such as *A. braziliensis*. My large plants of *Beschorneria yuccoides* were killed, but young ones are coming away freely from the base; even this is surprising, as this *Beschorneria* has not been considered as hardy in these parts even in a mild winter. I should add that most of the plants I have mentioned above are being grown in narrow beds facing South, with a low brick wall behind them; but this winter the cold was so intense and so persistent that frost penetrated the soil to a great depth everywhere, and the wall was of little protection. I do not believe that several degrees of frost in excess of what we experienced would have made any difference, as my plants received no additional protection such as a mulching of leaves or straw because such frosts were quite unexpected. With a little attention of this kind I feel sure that they could even have withstood the more severe cold of many States on the Eastern sea-board of the U. S. A. provided that they were planted in light and well drained soil. A curious effect of the unusual cold has been that it seems to have increased the floriferousness of some plants. I grow a number of *Zephyranthes grandiflora* (*carinata*) in pots in a greenhouse which used to be heated in winter but this year was practically a cold house. These bulbs flowered magnificently, ten or more flowers being out at the same time in each 4 inch pot, although the soil had been frozen almost solid in January. This species is not

very easy to flower in pots over here, but with the experience gained I shall now try other *Zephyranthes* species and other genera in much lower temperatures while they are at rest. It may be that this will increase their floriferousness, and it is an experiment worth trying; I should be glad if it could be tried elsewhere too and the results published.

* * * * *

Amaryllis (Hippeastrum) calyptrata X. *A. auluca*. As I had plants of these two species in flower at the same time, I crossed them. I was successful in obtaining a good pod of large winged seed, which has proved fertile and has germinated *freely*. The result of this cross should be interesting, and I am glad that I was able to send some of the seed to Mr. Wyndham Hayward to raise for the A. A. S.

AMARYLLID MUSINGS

W. M. JAMES, *California*

Considerable data is available regarding bud formation and flowering of Narcissus. Briefly these bulbs should not be dug until the foliage is thoroughly ripened; flower bud formation does not start until after foliage is thoroughly ripened; and time of flowering can be advanced or retarded by control of temperature during storage and early growth periods (Herbertia Vol. V-1938, pages 177-196; Scientific Horticulture Vol. VI, 1938, pages 160-170; Bulletin No. 56, Laboratory for Flowerbulb Research, Lisse, Netherlands).

But what about some of the other amaryllids? The fall and winter of 1939-40 was abnormally warm in Southern California. This may or may not have affected bulbous plants. A few bulbs of *Haemanthus carneus* have bloomed the latter part of August for several years. This year they were in better bloom than ever before in the latter part of June while still on trays in the storage room. They were planted in early July and are developing foliage now.

This season I fully intended to cut bulbs of *Lycoris squamigera* at regular intervals in order to learn something about bud formation. Soon after the foliage had matured and had been removed in early June, several bulbs were examined. The only thing noticeable was apparently a "branch" or start of bulb division. Other work interfered with this project until July first when I was surprised to find 6-12-inch flower stems from a large percentage of the bulbs. They had never bloomed before until the latter part of August at Las Positas Nursery.

What influence does digging and disturbing roots have on the flowering of some of the Amaryllids? All of the "old timers" insist and written instructions emphasize that *Nerine* roots should not be disturbed if flowers are expected. And yet we have dug a collection of several different kinds each year as soon as they were dormant and kept them bare in storage at room temperature until growth began again without any apparent check on flowering. Several color forms of *Call-*

icore rosea (syn. *Amaryllis belladonna*, Herb., non Linn.) and several seedling selections of *Brunsvigia-Callicore* hybrids have been handled the same way. Incidentally, these hybrids are going to make a splendid item. Besides having fine flowers, the bulbs are nice to handle. The picture (Fig. 47.) shows bulbs of one kind several years after importation from Australia.

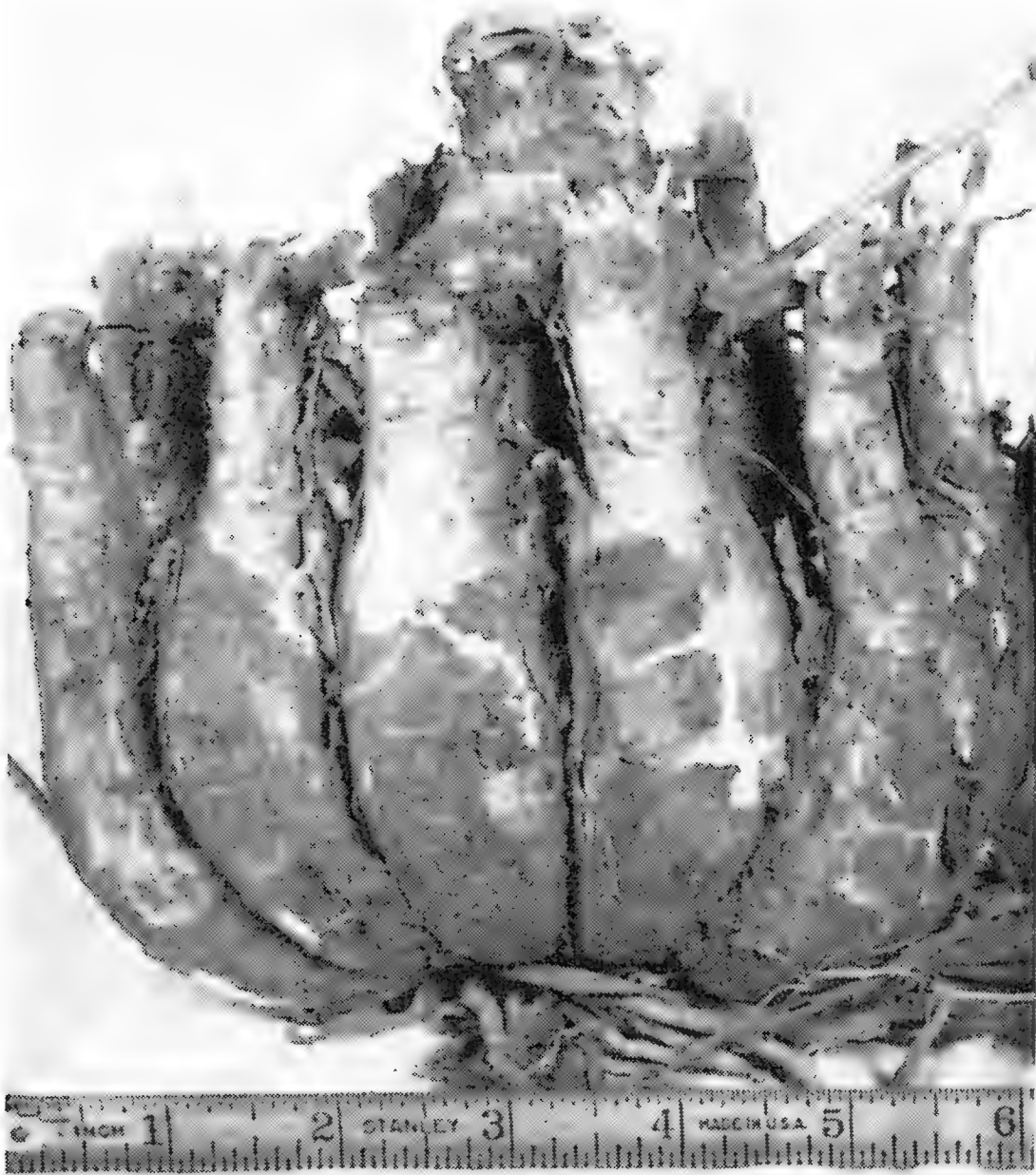


Fig. 47. Bulbs of *Brunsvigia-Callicore* Hybrid.

Apparently the flowering of *Amaryllis* (syn. *Hippeastrum* Herb.) *candida* is affected by digging. A collector in Brazil writes that they do not bloom in his garden for two years after being moved. Neither do they bloom for two years when the natives in Argentina move them into gardens from their native habitat. And yet one bulb of several recently imported from Argentina bloomed this spring before the foliage developed and another is blooming now, just as the foliage is apparently fully developed.

It seems that more observation and study than one individual can make is required to settle such questions.

There are times when I am puzzled as to just what a species is. Presumably it is what the geneticists would call homozygotes, or those plants having similar or like chromosomes. I have the following in my notes, although, unfortunately, the name of the writer has been lost. "Some are critical of what, in different hands, a species may be made to include or allowed to exclude; or its demarkation being loose and its name often indeterminate. A species is of course, only a unit of con-

venience and a specific name a means by which one man may let another know what he, the first, is talking about. No man-made conception can be final so long as human knowledge is capable of extension; neither can a description of any unit be more than approximately accurate, accuracy being incompatible with the human instrument. Moreover, no two individuals can be precisely similar whether the species to which they belong is of the animal or vegetable kingdom. One further point; A plant is not, and never will be, grouped and named primarily for the convenience of gardeners or foresters or herbalists or others whose concern is with its material value. Although the work of naturalists can be applied to the ordinary things of everyday existence, their true function is the study of life, its shapes and the relationships between these shapes. For such, a language is necessary; specific names represent the alphabet of that language."

Perhaps cytology (including chromosome counting) will eventually help to clarify and limit some of the more uncertain species. A paper recently published on *Calochortus* shows how the chromosome numbers indicated a natural and logical reclassification of certain species that were very puzzling from a taxonomic viewpoint (Cytological Studies in Relation to the Classification of the Genus *Calochortus*. J. M. Beal, Botanical Gazette, Vol. 100, No. 3, March 1939.).

A report in the Carnegie Institute Year Book (No. 38, 1938-39 Section on Experimental Taxonomy by Clausen and others) is very surprising. "Certain perennial plants with a wide distribution in a variety of conditions have the same chromosome number. Other plants had a wide variation in the species chromosome count. *Potentilla gracilis* Dougl., varying from 56 to 109 (octoploid to almost 18-ploid) in the somatic count. This extreme amount of cytological variation occurs within the Central Sierra Nevada Mountains (California) in what is recognized as a single taxonomic subspecies, although it is divided into several altitudinal ecotypes." These two almost contradictory reports are slightly confusing. Apparently, we still have a little to learn about plants.

Some of the amaryllid species seem more like hybrids than species to me. These would include *Alstroemeria chilensis*, and *A. ligtu*, and *Callicore rosea* with their color variations. *Amaryllis* (syn. *Hippeastrum* Herb.) *reginae* seems to be somewhat variable. None of the leading western botanists agree as to the taxonomic classification of several of the Genera found on the Pacific Coast. Robert F. Hoover (Midland Nat. 22:551-574. 1939) has recently done a good job in his revision of *Brodiaea* and this shows what can be accomplished.

Most of the *Brodiaeas* can still be found growing under natural conditions. These plants, as well as many others, change somewhat under cultivation and make it much more difficult to classify them properly under culture. Therefore it seems advisable to straighten out the classification as has been done with *Brodiaea* before they become too "civilized".

1. REGIONAL ACTIVITIES AND EXHIBITIONS

AUTUMN AMARYLLIS SHOWS, POMONA, CALIF., 1939 AND 1940

CECIL HOUDYSHEL, *California*

The Autumn Amaryllis Show in connection with the Los Angeles County Fair is an important means of publicity for amaryllids. This fair is the World's largest county fair. It was attended this year by nearly 750,000 people and nearly all view the floral exhibits because of their outstanding merit.

Prizes as high as \$500 are given for single exhibits, the amount won by Armocost and Royston for their orchid display both in 1939 and 1940. For amaryllids, the prize awards amounted to \$75 and this will be increased when warranted. This is an opportunity for all American growers who appreciate publicity. The numbers who view our exhibits may be compared with attendance at any flower shows, anywhere.

The 1939 Show was held on November 21 and 22. Nine exhibitors took part. A table over 50 feet long was well filled. The Sweepstakes Prize of \$25 is offered for the largest number of winning entries. The First went to the writer, Cecil Houdyshel, with 13 blue ribbons and two Third prizes.

Second in Sweepstakes, with an award of \$20 went to Mrs. Leonard Swets of Riverside.

Placing third, with an award of \$15. was W. E. Rice of Downey.

The Fourth with an award of \$10 was won by E. P. Zimmerman of Carlsbad.

Fifth place with an award of \$5.00 was won by an enthusiastic amateur, Mrs. W. E. Robbins of Artesia.

Other exhibitors who won ribbons were Richard Diener Nursery, of Oxnard; Mrs. Norma Cooper, Ontario; Mrs. Nana Giridlian, Arcadia; Mrs. G. E. Rawlins, Orland.

The flowers exhibited included, *Callicore rosea* (*Amaryllis belladonna*), *Cooperia*, *Crinum*, *Habranthus*, *Haemanthus*, *Amaryllis* (*Hippeastrum*), *Hemerocallis*, *Lycoris*, *Nerine*, *Polianthes*, *Sternbergia*, *Val-lota* and *Zephyranthes*.

Altho more flowers were shown in the 1940 Show, more rare and outstanding exhibits and more space occupied, fewer exhibitors took part. This is probably the fault of the writer. In 1939 we wrote over 50 personal letters urging participation in the event. That is quite a chore in our very busy fall season and we could not do it this year. Let it be understood this Fall Amaryllis Show is an annual event. It may be participated in by anyone anywhere. The date of the show is announced in our Spring Catalogs and that date will not be changed as was the date we announced for the Spring Show at Montebello.

In staging the fall shows, exhibitors are invited to use any bulbous flowers or plants that will add to the interest of their display. Thus the writer usually uses a number of large out door grown Fancy Leaf Caladiums as a back ground. Several rare amaryllids having decorative foliage are usually used in the displays. None of these however are

subject to entry and are not considered by the judges in making awards. They are designed only to add interest and educational value to the displays. They help in attracting and holding attention.

This year, as in former years, the Amaryllids exhibits were always a center of attention. Many visitors with note book and pencil did just what we planned to have them do, and future reference to these notes will show in many gardens. Many visitors spoke of the Amaryllis Show as the most interesting of the floral exhibits, and complimented its educational value.

In our opinion the most outstanding display this year was that of the Las Positas Nursery of Santa Barbara. Only six entries were made by this wholesale nursery but each was awarded a blue ribbon and even that was scarcely enough recognition of its high merit. One entry, three huge umbels of *Haemanthus Katherinae*, was the finest thing in the show and was given a blue ribbon and a special award.

Nerines displayed by Las Positas were large vases of *N. Bowdenii*, *N. filifolia* hybrids (by James) and James' Hybrids. The latter are designed for propagation and final introduction. They are novelties of the highest merit. They are not repetitions of European introductions (as many American introductions evidently are) but carry distinction especially in colors shown. One of these has been named *Chameleon*. Mr. James' description appears elsewhere in this volume. Since flower colors often are classified differently by another observer, and may possibly even affect the nerve mechanism of sight differently we shall add our description.

The name, *Chameleon*, for this clone is well chosen. As we write seven stems are before us. At least three or four descriptions might be possible if exact color tones were represented for all. We choose the two with outer flowers recently opened. In these the petals are near to Tyrian Rose, (Ridgway). But this term is inadequate to express the full impression of its color. The natural sheen of a nerine flower is here present in an unusual degree and when a flower is turned in the light it glistens and glows from those surfaces in the correct angle between light, flower and eye as if covered by a million microscopic golden facets. As petals age they seem to pass through Amaranth Purple to Pansy Purple, and to fade into deep Plumbago Blue. The last color reminds me of the "blue" rose.

This cross (*N. filifolia* x *N. corusca major*) is a particularly well considered one and evidently designed to combine the rapid vegetative reproduction of *N. filifolia* with the larger and more attractively colored flowers of the pollen parent. In my opinion Mr. James has eminently succeeded and in this new race I shall expect to see nerines become more adapted to outside culture here in the hands of amateurs and hope some time to see them abundant enough to become a standard florist's flower.

We can foresee for Mr. James a name in amaryllid history. Many breeders begin with the best hybrids already available, and their introductions show less distinction than the introductions of those who use species as well.



John V. Watkins, Gainesville, Fla.

See page 51

Southeastern Amaryllis Show, 1940. Upper, Ralph W. Wheeler exhibit; lower, Mrs. R. E. Kline exhibit.

The Las Positas Nursery also showed *Calostemma aurea* and *Bes-sera elegans* winning six blue ribbons, and placed third in Sweepstakes. This nursery does no retail business. But we believe they are supplying to the trade a greater number of new bulbs than any other American grower.

Second in Sweepstakes was won again this year by Mrs. Leonard Swets of Riverside, with five Firsts and three Seconds. She showed fine specimens of *Vallota purpurea*, *Hemerocallis fulva*, *Amaryllis aulicum*, *Lycoris radiata*, *Amaryllis advena* and others. Mrs. Swets is an enthusiastic grower of amaryllids, specializing in *Amaryllis* (*Hippeastrum*) seeds of very high quality, which she sells both wholesale and retail.

Fourth place in Sweepstakes was won by W. E. Rice of Downey. Mr. Rice showed *Lycoris aurea*, *Sternbergia lutea* and a large display of high quality *Amaryllis* (*Hippeastrum*). He won four blue ribbons and one second.

As a grower of fine amaryllids, Mr. Rice is coming up front. He has recently acquired large stocks of nerines in both species and hybrids. One new hybrid nerine, the complete stock, was recently received from the Guernsey Isle. It will be one of the best acquisitions in our floriculture. Another rare bulb recently received was *Lycoris radiata alba*.

As we have said before the Rice *Amaryllis* (*Hippeastrum*) are outstanding in quality and the fact that he could show so many perfect specimens on a fall date makes them appear to be among our best out of season or fall bloomers. Mr. Rice is a wholesale grower and does no retail business.

Fifth place in Sweepstakes was awarded to Mrs. Leonard Slosson of Los Angeles. Mrs. Slosson showed *Sternbergia lutea* and *S. macrantha*, *crinums* and *Callicore rosea* (*Amaryllis belladonna*). She is a most enthusiastic amateur grower and is constantly enlarging her collection of amaryllids.

The writer, Cecil Houdyshel, was awarded the First Prize in Sweepstakes. He placed over forty entries; all distinct species or varieties. The Judge, Mr. Fred Howard, awarded to these 17 Blue Ribbons, 12 Seconds, and 3 Thirds. About 10 entries were wholly disqualified, altho there was no competition. Possibly our best exhibit was a vase of hybrids,—Brunsdonnas (*Brunsvigia* x *Callicore rosea*).

It is planned to revise somewhat the method of awarding the Sweepstakes. More credit should be given to the relative merit of the entries and less to total number of winning entries.

NATIONAL AMARYLLIS SHOW, 1940, MONTEBELLO, CALIF.

CECIL HOUDYSHEL, *California*

The show at Montebello was held in the large offices and display room of Howard and Smith on April 12, 13 and 14, 1940. Several nurseries who feature *Amaryllis* (*Hippeastrum*) and other amaryllids and a few amateurs cooperated fully and brought outstanding exhibits.

As a show it was a good one. However, on account of the "very unusual" hot weather which arrived on the opening day, the attendance was below average. It was not only hot but very hot the first and second days of the show. The last day, Sunday, was comparatively pleasant, not cool, and on this day only the attendance was good.

Perhaps a contributing restriction on the attendance might have been the admission charge. But this could hardly be true for the 25c fee should not affect this region noted for its appreciation of flowers.

All who know the reputation and the merit of their stock would expect from Howard and Smith the outstanding exhibit and they did not disappoint. For "*Amaryllis (Hippeastrum)* species" shown, they won First, Second and Third. Also First on best "Collection of Species." In *Amaryllis (Hippeastrum)*, Grandiflora Group, First Prizes for "Best Collection of Ten or More"; Best "Display of Hybrid *Amaryllis*"; "White, with Light Marking", "White, with Stripes, Keels, Tips, etc," (as well as Second and Third); "Pure Orange Scarlet, no Markings"; "Orange Scarlet, with Markings"; "Pure Light Red, no Markings"; "Light Red with Markings"; "Pure Deep Red, no Markings," (also Second and Third).

Four Specials were given to Howard and Smith hybrid *Amaryllis (Hippeastrum)*.

In all this firm won eleven First, six Seconds and five Thirds, a total of 22 Ribbons. With a more complete schedule they could have won several more as several varieties of merit were shown that could not qualify in the color classes offered. Among these were fine flowers of rose and pink.*

W. E. Rice, of Downey, is an outstanding grower of Hybrid *Amaryllis (Hippeastrum)*. At present his fields of many acres, solidly planted, accomodate several hundred thousand bulbs. He has no greenhouses. All are absolutely field grown. Before the show it was conceded that field grown Hybrid *Amaryllis (Hippeastrum)* should not be shown in competition with those greenhouse grown. Rather empirically it was decided to classify the field grown in the Decorative Group and the greenhouse grown flowers in the Grandiflora Group, although such grouping may not accord with either theory or practice. In addition to highest decorative merit Mr. Rice's Hybrid *Amaryllis* possess a rugged constitution and strong vegetative functions.

Mr. Rice won Firsts in the Decorative Group for "Pure White", "Orange Scarlet with Markings"; "Light Red with Markings", (also Second and Third); "Pure Deep Red, no Markings", also Second and Third) and "Deep Red with Markings". He also edged in on the Grandiflora Group and in competition with greenhouse grown flowers won First on "Deep Red, with Markings". Mr. Rice also could have won more ribbons on a more extended schedule. His display worthily occupied a prominent position in the Show. He won a total of eight Firsts, three Seconds and three Thirds, a total of 14 Ribbons.

* Such exhibits should be placed under "any other color,"—Ed.

Placing third for the best display of *Amaryllis* in the Show, The Hunt Nursery showed that they were up and coming in this field. They showed many beautiful specimens, field grown and classed in the Decorative Group. This Nursery won three Seconds and three Thirds, an excellent showing considering the stiff competition.

Mrs. Leonard Swets of Riverside who is a commercial grower of *Amaryllis* seeds entered only a small exhibit but made up for it in quality. Her huge white *Amaryllis* was really one of the outstanding entries. Visiting reporters hopped on to it, made photographs and featured it in writing up the show. It won the Blue as best white in the Grandiflora group. The flower was pure white and must have been near to 11 inches across. Mrs. Swets also won First for White with markings; *Hemerocallis* and *Crinums*, a total of four Firsts. There was a blue ribbon on nearly every entry for Mrs. Swets.

The Blue Ribbon for the best *Clivia miniata* hybrids went to the well known clivia grower and breeder, E. P. Zimmerman of Carlsbad. Although the date was very late for clivias here he succeeded in showing flowers of the highest standard. He won two blue ribbons.

The Oregon Bulb Farms sent down a large collection of the newer hybrid daffodils. These were in perfect condition when judged on the first day but naturally could not last thru the show in such hot weather. Many very rare and exquisite varieties were shown. A Blue Ribbon was placed on this entry which was classed as a collection.

The change in the date of the show at a late period to one week earlier than that decided on by a committee of three threw out the writer, Cecil Houdyshel from competition in *Amaryllis* (*Hippeastrum*). Our flowers, so far inland, are a little later than those near the coast. Our soil too is heavy, not sandy, and that means later flowers. We do not grow the large quantity but have some fine ones.

We won first for Double *Amaryllis*, *Clivia* Species, *Clivia nobilis* hybrids, *Pancratium illyricum*, *Phaedranassa carmioli*, *Sprekelia formosissima*, *Leucojum aestivum* and *Hymenocallis* species. We won nine Firsts and three Seconds, although several of our entries which won were credited to other exhibitors in the trade paper reports of the show.

The judges of the Show were Ernest Braunton, the well known horticultural writer, of South Pasadena; and William Hertrich, Director of Huntington Library and Huntington Gardens, Pasadena.

SOUTHEASTERN AMARYLLIS SHOW, ORLANDO, FLA., 1940

WYNDHAM HAYWARD, *Florida*

The 1940 Southeastern Regional *Amaryllis* Show was held at the Theodore L. Mead Botanical Garden between Winter Park and Orlando, Florida, April 13 and 14, with notable displays of the giant flowers by numerous amateur and professional growers.

The scene of the exhibition was the orchid house of the botanical garden, which was opened recently as a memorial to the late Mr. Mead, one of the pioneer horticulturists of Florida and a leading hybridizer

of *Amaryllis* in his day, being the originator of the "Mead Strain".

More than a thousand choice blooms of hybrid *Amaryllis*, *Amaryllis* species, *Zephyranthes*, *Cooperias*, *Crinums* and related plants were on the benches, and a large attendance of flower lovers from all parts of the state and the Southeast was recorded for the two-day event.

Outstanding displays of the show were set up by R. W. Wheeler, Winter Park, and Mrs. R. E. Kline, Windermere (Plate 173). There were also worth-while showings offered by Peterson and Riedel, Orlando; Frank Vasku, Winter Park; Wyndham Hayward, Winter Park; Dr. Hamilton P. Traub, Orlando, and others.

The judges were Prof. E. L. Lord, Orlando, Mrs. Fred Yerkes, Jacksonville, and Russell S. Wolfe, Orangeburg, S. C. R. W. Wheeler, Winter Park, was show manager, and the event was held in the Mead Botanical Garden with the cooperation of the garden authorities, headed by Prof. E. O. Grover, of Rollins College, president of the garden organization, and Jack Connery, director.

R. W. Wheeler won the "best Bloom" award in the show with a huge strawberry-lavender red flower of *Leopoldii* type, brilliant and full-petaled. The variety was given the name "Beacon". Awards of Merit were made to Mr. Wheeler and Mrs. Kline for their exhibits. Mrs. Kline's display was of mainly "rainbow and tricolored" types.

Two other awards of merit were voted by the judges, one to Dr. Traub for his entry of *Amaryllis* species, and the other to the flower of a single specimen of *Cooperanthes*, the rare bi-generic hybrid between *Cooperia* and *Zephyranthes* originated by Mr. S. P. Lancaster in India. It was grown and exhibited by Wyndham Hayward, who also displayed a vase of the new hybrid *Crinum*, *Wormley Bury*, grown in Florida from seed hybridized in England by Major Albert Pam, noted British amaryllid specialist, and named by Major Pam after his country estate. It was the first time the *Cooperanthes* and the hybrid *Crinum* had been shown at any flower show in America.

An attractive display of hybrid and species *Crinums* was arranged by Mr. Hayward, along with seedling and named varieties of early-blooming *Hemerocallis*. J. J. McCann, of Punta Gorda, exhibited some interesting double types of hybrid *Amaryllis*.

Other exhibitors included Mrs. A. R. Bogue and L. S. Thornton, Orlando; Mrs. W. G. Tilghman, Palatka; Dr. Traub and Mr. Thornton received one first class certificate each for hybrid *Amaryllis* blooms; Mr. Wheeler received three first class certificates, and the *Crinum*, *Wormley Bury*, received a first class certificate.

Mr. Wheeler won 19 blue ribbons for his entries of hybrid *Amaryllis*; Mrs. R. E. Kline won 13 blue ribbons for hybrid *Amaryllis*; Wyndham Hayward won 15 blue ribbons for various hybrid *Amaryllis*, *Crinums* and *Daylilies*; Frank Vasku won eight blue ribbons for *Amaryllis* and related bulbs, including *Cooperia* and *Zephyranthes*; Dr. H. P. Traub, six blue ribbons; L. S. Thornton, one blue ribbon; Mrs. W. G. Tilghman, two blue ribbons; J. J. McCann one blue ribbon.

FIRST NATIONAL DAYLILY SHOW, ORLANDO, FLA.,

APRIL 18 AND 19, 1940

WYNDHAM HAYWARD, *Florida*

The first competitive all-daylily show in the history of the world was conducted by the American Amaryllis Society April 18-19, 1940 at the Mead Botanical Garden in Orlando-Winter Park, Florida. The event was planned as the first of a series of similar annual major exhibitions, and was held with the cooperation of the Mead Garden authorities, and various Florida daylily enthusiasts, including the State Agricultural Experiment Station workers.

The show brought out a large display of standard and new types of species and horticultural varieties, representing most of the leading hybridizers in America and England.

The show was scheduled at the height of the daylily blooming season in Florida, which is two to three months ahead of the similar period in more northerly climates. The show was well attended.

Of special interest was the display brought from the Florida State Agricultural Experiment Station at Gainesville, Fla., by Prof. John V. Watkins, of the Department of Horticulture at the University of Florida. This included several flowers of the new red variety, *Mrs. John J. Tigert*, which will be released shortly by the State authorities for a limited distribution. The State has maintained an important project for the growing and breeding of hybrid *Hemerocallis* and Species for several years, originally under the direction of Dean H. Harold Hume.

The Orlando display featured vases of the common lemon and tawny daylilies (*H. fulva* and *H. flava*) and many of the hybrid clones of international note originated by the late George Yeld, Dr. A. B. Stout, Amos Perry, Carl Betscher, H. P. Sass, etc., in addition to the entries of originations of Florida hybridizers, including Dr. H. P. Traub, Orlando; Prof. E. L. Lord, Orlando; R. W. Wheeler, Winter Park; Wyndham Hayward, Winter Park; and Mrs. G. B. Knight, Orlando.

An unusual dark purplish-red type of flower was exhibited for Dr. Leon H. Leonian, specialist in red *Hemerocallis*, Morgantown, W. Va., which was grown by W. Hayward.

Outstanding blooms in the show besides *Mrs. John J. Tigert*, were *La Tulipe*, a magnificent cottage tulip-shaped bloom from Dr. Traub, with most unusual dark cardinal and orange coloring; also *Hector*, an interesting pastel shaded bloom from Prof. E. L. Lord, and *Ruby Supreme*, a completely new dark ruby red bloom from R. W. Wheeler, of large size and wide open flower character, which seems destined to make daylily history.

Many interesting seedlings in red, copper, bronze, chocolate, ruby, pinkish tones, etc. were on exhibition, showing the trend away from the usual oranges and yellows that is showing itself in the daylily breeding field.

Mr. R. W. Wheeler was show manager, and cooperation was extended personally by Dr. E. O. Grover, President of the Mead Garden,

and Jack Connery, Director. Prof. Watkins was head judge of the competitive classes, the University collection being entered for display purposes only.

Awards made were as follows in the competitive classes: *Blue ribbons*—(1st. place) H. P. Traub, 5 (for the clones *La Tulipe*, *Fred Howard*, *Mayor Starzynski*, *Indian Chief* and *Carnival*); Wyndham Hayward, 40; E. L., and R. P. Lord, 18; R. W. Wheeler, 53; Mrs. G. B. Knight, 4; Frank Vasku, 4; Mead Botanical Garden, 1. *Red ribbons*—(2nd. place) H. P. Traub, 3; Wyndham Hayward, 3; E. L. and R. P. Lord, 3; R. W. Wheeler, 1; Mrs. G. B. Knight, 1; Frank Vasku, 5; Dr. Leon H. Leonian, 1. *White ribbons*—(3rd. place) H. P. Traub, 1; W. Hayward, 1; R. W. Wheeler, 1; Frank Vasku, 1.

Awards of Merit were made to the following displays: The University of Florida Exhibit; Dr. Hamilton P. Traub display of 35 unnamed seedlings of rainbow shades; Wyndham Hayward display of many excellent named clones; and R. W. Wheeler display of 50 unnamed dwarf seedlings in bright colors.

First Class Certificates were awarded by the Society to the following clones: *Patricia* (Stout) exhibited by Hayward; *Dauntless* (Stout) exhibited by Hayward; *La Tulipe* (Traub) exhibited by Traub; *Ruby Supreme* (Wheeler) exhibited by Wheeler; *Emperor Jones* (Hayward) exhibited by Hayward, and *Hector* (Lord & Lord) exhibited by the Lords; and *Mrs. John J. Tigert* (Univ. Fla.) exhibited by the University of Florida.

THE CALIFORNIA DAFFODIL CONFERENCE, 1940

FRANK A. LEACH, *California*

Under authority of the Council of the California Horticultural Society, an all day conference on daffodil growing, breeding and distribution was held at the University of California, Berkeley, March 16, 1940. President Sydney B. Mitchell presided over the first daffodil conference.

Mr. and Mrs. Kenyon Reynolds of Pasadena staged a fine collection of named varieties and seedlings. Visits were made Saturday and Sunday to President Mitchell's garden to see his fine new seedlings. A few flowers were also contributed by Drew Sherwood, Oswego, Oregon. Dr. S. S. Berry, Redlands, Calif.; Joseph Urmston, San Marino; Sydney B. Mitchell, Berkeley; Peter Valinga, San Mateo; and Frank Leach, Diablo, Calif.

The following papers were presented at the morning session:

“Daffodils for the Average Gardener in California” by J. A. McDonald, Niles, Calif.

“Daffodils for the Advanced Amateur in California” by Kenyon Reynolds, Pasadena, Calif.

“Daffodils in the Pacific Northwest” by Grant E. Mitsch, Lebanon, Oregon.

“Notes on Rock Garden Daffodils” by Drew Sherrard, Oswego, Oregon.

“The Use of Daffodils as Garden Decoration”, by Lockwood and Elizabeth de Forest, Santa Barbara, Calif.

“The Woodside Project in Popularizing Daffodils” by Mae Vrooman Forbes, Redwood, Calif.

“Daffodil Diseases”, a letter from Frank P. McWhorter, Corvallis, Oregon.

“Breeding Daffodils in Oregon” by E. N. Hornbeck, Sandy, Oregon.

“A Few Random Daffodil Notes from Southern California,” by Dr. S. Stillman Berry, Redlands, Calif.

The afternoon session was devoted to a very full and profitable discussion of the papers presented. The July issue of the Journal of the California Horticultural Society contains the papers and the discussions in full.

CALIFORNIA SPRING GARDEN SHOWS, 1940

L. S. HANNIBAL, *California*

The 1940 Annual California Spring Garden Show was held May 1 to 5 at the Oakland Civic Auditorium. This show is sponsored each year by the Oakland Business Men's Garden Club with the assistance of various garden clubs in the San Francisco Bay Area. As usual the design was executed by Howard Gilkey, noted California landscape architect.

Although the American Amaryllis Society has taken no active part in the exhibitions, several local sponsors entered a number of Hybrid Amaryllis. Peter Valinga of Burlingame exhibited a large number of Holland imported white Amaryllis of the Leopoldii type making a striking indoor display. Herman Brown of Gilroy also had a number of his red-white hybrids on display. The San Francisco Garden Club contributed a number of mixed Reginae type hybrid amaryllis in a large outdoor display which created considerable interest in the possibilities of use of these flowers for outdoor gardens in the bay district.

The C. F. Michaels estate of Menlo Park received a second class award for an hybrid amaryllis display. This was the only award issued to any amaryllis display.

The University of California furnished a display of a number of amaryllids and alstroemerids obtained from their Andes Expedition collection. These included *Bomarea*, and *Alstroemeria* of several types with marked color ranges, *Hymenocallis multiflora* and an unidentified *Amaryllis* (*Hippeastrum*) species. The latter should be of particular interest to the members of the American Amaryllis Society due to the unusual red and green checkered effect exhibited on the inside of the lower petals.

VISITS TO THE GARDENS OF DAYLILY ENTHUSIASTS

ELMER A. CLAAR, *Illinois*

My notes and observations are probably highly presumptuous, therefore, I wish to issue a few personal words of warning directed to anyone who reads anything that I write about flowers. I have some very definite prejudices about bloom and color of flowers and it will very likely be reflected in my notes.

My observations about the new daylilies must be taken as from one who has seen only a few of them. One person can hardly see all of the good new daylilies under present conditions. I missed many fine new things and I have seen other fine things at a disadvantage. I had to hurry from garden to garden which isn't conducive to thorough study. I missed the very fine gardens of the Sass Brothers, Carl Betcher, Paul Cook and many others whom I might enumerate. I very decidedly want the daylily enthusiasts who read my notes to state wherein they disagree with me.

During the latter part of April and May I took a trip to Florida and during the month of August I went to New York and New England to see the gardens of daylily specialists. I was much impressed by the high quality and large percentage of very lovely seedlings. You will undoubtedly be offered in the near future pink, rose, raspberry, red, maroon, bi-color and vari-colored daylilies of various sizes, shapes and blooming seasons.

Dr. A. B. Stout says he has critically examined over 100,000 seedlings; Dr. Hamilton P. Traub says he is growing over 30,000; Mr. J. B. Norton, Hyattsville, Maryland, says he has discarded over 20,000; Mr. Milton A. Rubel says, "I am planting around 30,000 hand crossed seeds a year and in several seasons I expect to have quite a nice showing of Daylilies." I didn't ask Mrs. Thomas Nesmith as to how many seedlings she has but from the size of her seedling beds she must have from forty to fifty thousand. I do not know how many she has discarded. Mr. Ralph Wheeler has between five and ten thousand seedlings, and Mr. Hayward has several thousand. Mr. David Hall has critically examined over one thousand seedlings. I have over 1000 seedlings.

My trip to Florida was unfortunate as to time inasmuch as the peak of the bloom of the daylily had not as yet arrived but I saw many lovely and interesting gardens and met a host of hospitable daylily enthusiasts.

I first went to the Fairchild Tropical Gardens located just south of Miami. They were not much interested in any Herbaceous perennials although I was informed they had some daylily plants sent them by Mr. Lord. I did not see them in bloom.

I then went to the very interesting Plant Introduction Garden of the United States Government just south of Cocoanut Grove at Chapman Field. The Superintendent, Mr. McClelland, said he was not particularly interested in daylilies and that the station had only a few ordinary clones but he told me that Mrs. Clifford Cole of Cocoanut Grove was an enthusiast and that perhaps the Palmetum of Col. Robert M. Mont-

gomery might have some daylilies. Mr. Montgomery was not in but his Superintendent, Mr. Jordahn, very cordially showed us around this marvelous garden. There were palms of every variety but we saw only a few daylilies. They were not in bloom and were not labeled.

Our next call was at Mrs. Clifford C. Cole's lovely garden at Coconut Grove. She is very enthusiastic about daylilies and has quite a nice collection. Mrs. Cole was most gracious and showed us her amaryllis and daylilies. Most of her daylilies were not in bloom at this time. She is doing some hybridizing and has quite a number of seedlings but has not introduced anything as yet.

We drove to Royal Palm State Park, twelve miles southwest of Homestead which is a remarkably natural "Hammock" preserved by the club women of Florida. Geographically it lies several hundred miles south of Cairo, Egypt and therefore it is tropical. There were remarkable specimens of the royal palm (*Roystonea regia*), and beautiful arboreal snails, but no daylilies.

We drove to Key West but found no evidence of daylilies there, nor on Sanibel Island, and Fort Meyers on the West Coast. We drove up to the Florida Everglades Experiment Station at Belle Glade at the south end of Lake Okeechobee. At the homes of the employees there are lovely beds of daylilies. I called at the Superintendent's home but he was out. His wife informed me that her husband's predecessor had been a daylily enthusiast but that they had no particular interest in the plants. Here I recognized *Mikado* and saw many good yellow and orange clones growing beautifully. I was told that they bloom profusely several times a year.

I had been in communication with the group of daylily enthusiasts around Orlando and Winter Park so we drove up there and we certainly did strike gold. This region has a number of very enthusiastic daylily fans. Most of them are hybridizing on an extensive scale. They have a high standard, a lofty idealism and keen intelligence. Here the American Amaryllis Society was formed and here are most of its officers. You can get some lovely daylily hybrids from this section of Florida now and many more will be offered to the public in the near future.

We first visited the Lakemont Gardens of Wyndham Hayward of Winter Park, Florida. Lakemont Gardens is a commercial nursery with one of the finest commercial collections of daylilies that I know of in America. Mr. Hayward is our genial and efficient Secretary and he was most cordial. I understand that Mr. Hayward was originally in the newspaper business—I did a bit of reporting once myself so here was a common bond. Dr. Traub later told me his own interest in daylilies arose from seeing Mr. Hayward's lovely plants. We were somewhat early to see Mr. Hayward's seedlings at their peak but I was so enthusiastic about them that I am now growing in my own garden most of his introductions. His *Emperor Jones* is one of the finest reds that I have seen this year. *Araby* is a "must have" in my estimation. I also like *Antares* which is a good red but not of the calibre of *Emperor Jones*. I am also growing his *E. W. Yandre*, *Lenore*, *Ramona*, *Minnie*, *Sally*,

Ralph Wheeler, De-Lovely, William Pelham and Florida. Some of these plants I have not seen in bloom but I have seen enough to know that I want all of his introductions. I had a very pleasant visit with Mr. Hayward and took some colored still pictures of his seedlings and colored movies of him hybridizing daylilies in his garden. I plan to see his garden again at the peak of daylily bloom and I look forward to this experience with a distinct thrill.

From here I went to the home of Mr. Ralph W. Wheeler, of Winter Park, who is Treasurer of the American Amaryllis Society and another enthusiastic amaryllis and daylily hybridizer. My experience with amaryllis is very limited but here I saw the loveliest pink clone that I have ever seen. I have a lovely colored picture of it. We visited his daylily seedling beds of several thousand plants and selected and tagged a number that were very beautiful. None of his seedlings had been named at that time. I hope to be growing some of them very soon.

Our next visit was to Dr. Hamilton P. Traub, our efficient Editor. Mr. Gore had told me about Dr. Traub and I was glad to meet him. He has a beautiful estate called Mira Flores just outside of Orlando. Dr. Traub told me that he was at present growing over thirty thousand daylily seedlings. Most of these were young seedlings and again I was rather early for the bloom but we saw some delightful things and I am growing his *Granada*, (this bloomed for me twice this year after I planted it in May. The color was very good), *Duchess of Windsor*, *Victory Taierchwang*, *Dr. Stout*, *Estelle Friend*, *Wekiwa* and *Happiness*.

Wyndham Hayward says that the flower of *Indian Chief*, a Dr. Traub introduction, is nine inches in diameter in his garden. I also heard that Dr. Traub's *Dr. Stout* is a very brilliant "Sunburst". The Doctor has thirty-eight named seedlings up to this time. Although I have seen few of them in bloom up to the present, I feel that we will shortly see many very lovely ones from this garden. I only wish I might have been there at the peak of the bloom. The Doctor had been growing the species (*Hemerocallis exaltata*) for several years but it was not happy and had not grown properly in the sub-tropic climate of Orlando so he asked me to grow it in Illinois where he hoped it might prosper. I took the plant and am now growing it in my garden. It appears to be happy for it gained more in Illinois in four months than it had in Florida in several years. I have never seen it bloom but understand that it may be valuable for hybridizing. Early this summer Dr. Hamilton P. Traub transferred from Orlando to Beltsville, Maryland and moved his thirty thousand seedlings with him.

While in the Orlando section I missed the gardens of R. P. Lord and E. L. Lord, two daylily enthusiasts who are also engaged in hybridizing daylilies.

We next stopped at the Mead Botanical Garden in Orlando—Winter Park. I have been told that it is planned to sponsor a daylily trial garden at this institution. This spring the first National Daylily Show was held in Orlando, and from all reports it was a splendid success.

My next stop was at the McKee Jungle Gardens at Vero Beach, Florida. It was especially interesting to me inasmuch as one of its owners, Mr. Sexton, was a business associate of my father's years ago. McKee's Jungle Gardens are one of the horticultural wonders of America. However, they were specializing in tropical and semi-tropical plants and only have a few daylilies at present.

I did not see any daylilies on my visit to Bok Tower and Gardens at Lake Wales. At Fort Lauderdale are two horticultural enthusiasts, Mr. Gore who at one time was Executive Secretary of the Amaryllis Society. Mr. Gore is now centering his interest in orchids and he has a very fine collection. His daylilies are at his place near Chicago. Dr. Wilhelm, another horticultural enthusiast at Fort Lauderdale was growing about thirty different daylily clones at his place in Fort Lauderdale. I sent them to him. He has many more at his farm near Chicago.

I did not visit the University of Florida gardens at Gainesville where one can see a fine trial garden and meet two daylily enthusiasts, Prof. Watkins and Dr. Hume. Nor did we get to the Oriental Gardens near Jacksonville; to Mr. Shoemaker's Jacksonville Landscape Company of Jacksonville, Florida; or the plantings of Mrs. H. E. Carter at Tallahassee. I hope to see all of these in another year.

During the latter part of August, I took a trip to New York and New England. I first went to the New York Botanical Garden and was royally entertained by Dr. A. B. Stout. He had lovely *Linda* in typical bloom, (my wife says this looks like an orchid), and also *Rajah*. Here I saw for the first time *Charmaine*. It is described by Dr. Stout in his book on Daylilies, as a clear rosy pink of a shade that closely approaches pink. I would describe it as a pink with silver-white edges and a white line down the center of the petals. Three segments are slightly recurving and the others are fairly straight. It is tops. I saw the pinched and twisted *Taruga*. Daylily enthusiasts owe Dr. Stout a debt of gratitude for he is one of the pioneers in this field and has introduced more first class seedlings, according to the votes of the Amaryllis Society poll, than any other hybridizer. The Doctor showed me *Majestic* which he said was one-third the size of a typical bloom because it was at the end of its blooming period. It has good form and a clear color. I did not see his new seedling beds but I did see his selected seedlings. The Doctor is in the process of preparing a portfolio on *Hemerocallis* which will be the finest thing of its kind. The project has met with difficulties due to the expensive and numerous color prints. We spent considerable time discussing his proposed book. I think a laudable object of this Society and of any Society interested in beautiful flowers would be to help work out a plan to acquaint daylily enthusiasts with this book, and get enough enthusiasts to subscribe toward publishing it.

I saw some lovely seedlings in bloom at this time but Dr. Stout told me that he had already spent a considerable time thinning out his seedling beds. I did not succeed in getting any pictures of his seedlings so I am not in a position to give much of a report on what we may expect in the next few years from Dr. Stout. All of Dr. Stout's introductions are sold by the Farr Nursery Company at Weiser Park, Pennsylvania,

and many of his introductions have been so sought after that they are listed in other nursery catalogues at two and three times what they were offered for by the Farr Company at the time of introduction. This is indeed a high tribute to Dr. A. B. Stout and the Farr Nursery Company.

After my visit with Dr. Stout I took a train to Lowell, Mass. to Fairmount Gardens, the delightful home and gardens of Mr. and Mrs. Thomas Nesmith. These gardens, in the hills of New England, had lovely trees in the background—I saw them against an azure blue sky with cumulus and cirrus clouds languidly floating by. In the foreground were hundreds of lovely vividly colorful daylilies—pink, raspberry, rose, red, maroon and peach colors. In fairness to the other hybridizers I must say that there was more peak bloom at the time that I called here than there was at any other garden either in Florida or the East. I was especially impressed with her seedlings.

The Nesmiths were most cordial and I certainly spent an exciting and lovely day. Mrs. Nesmith said she had just sent six hundred scapes of her daylilies to the New York World's Fair Gardens where she received a gold medal of which she was rightfully proud. I did not see a number of her very fine things but I saw so many rare and vividly colored clones that my enthusiasm mounted tremendously. I took two hundred feet of colored movies in her garden and they turned out to be some of the best colored pictures that I have ever taken.

I was already growing the following daylilies introduced by Mrs. Nesmith—*Burgundy*, *Burmah*, *Gay Day*, *Autumn Haze*, *Golden Dawn* and *Oriole*, none of which had bloomed as yet in my garden. I was also growing *Crown of Gold*, *Heather Rose* and *Starlight*, each of which bloomed in my garden. I did not get my *Crown of Gold* from Mrs. Nesmith and I did not see it bloom in her garden. I wonder if I really have it as my plant looks like a twin of *Dover*. *Heather Rose* was distinct and lovely in my shady garden but I was disappointed in *Starlight*. While it is the lightest yellow I grow, it is not close to white and I should like to see it bloom on an older plant to see if this will improve its form.

Among her 1939 introductions I liked *Dawn Play*, *Bold Courtier* and *Petra* best but I did not see *Pink Lustre*, *Sweetbriar*, *Persia*, *Princess* or *Dolly Varden* in bloom. Of the 1940 introductions I liked *Pink Charm* best. It impressed me as a dusty pink of a coral shade and I do not like it as well in my colored pictures as I do *Charmaine*. This might be the fault of the pictures but I don't think so. It is an entirely different shade from that of *Charmaine*. However no one is able to buy *Charmaine* so I bought *Pink Charm*. I am now growing *Amulet*, *Dragon* and *Highland Chieftain* among the pastel colors. *Moonray* is a small *Mikado*, a dainty little yellow with a spot on its throat. At the time that I saw it in her garden I liked it very much but after seeing my movies I should like to see it again to examine it for form before buying it.

You should see *Golden West* as Mrs. Nesmith grows it. It is one of the very best yellows that I have seen. It made me wonder if I had the same plant. Mrs. Nesmith introduced this clone. She said the stock had been mixed by the hybridizer. I bought another plant from her and shall grow it beside my "*Golden West*" and compare them.

China Sea reminded me of *Araby* with its lovely halo. I have no more room in my yard for midsummer yellow or orange or apricot daylilies unless they are so lovely and distinctive when I see them as to literally force themselves upon me. However, I thought well enough of *China Sea*, *Satsuma* and *Summer Gold* to take their pictures in color even if I do not buy them. All of these flowers have a halo and each is very pretty. Among the reds I like *Morocco Red* and the deeper *Mata-dor*. *Royalty* is a maroon purple. *Purple and Gold* is a deep purple-toned red. I am intensely enthusiastic about Mrs. Nesmith's seedling beds. She will have more beautiful things for us later.

H-39-116 is the most vivid, vibrant deep cherry red of any daylily that I have seen. Its color is most distinctive. It glistens and radiates warmth. As soon as this seedling is available I shall be growing it.

H-40-222 is utterly stunning. I called it "*Honey Red Head*" and Mrs. Nesmith appeared to like the name. Well, it is away far in advance of anything that I have ever seen in its color class. It has a deeper tone than H-39-116 and at the edge of the segments the color changes to a much lighter color—a sort of silver edge. There is a light stripe of yellow down the center of the segments that broadens out into a golden throat. I will have this clone also as soon as I can.

H-38-345 is an especially lovely deep maroon with large white lines in the middle of each segment. It is interesting and utterly lovely. I should like to compare this with Mr. Hayward's *Emperor Jones* in my garden.

I am especially fond of bi-colors. I was much impressed by H-39-48. Its form shows its *Byng of Vimy* parentage. It is very large and presents the most vivid contrast of any bi-color that I have seen. Three segments are cherry red with a brown cast and with a yellow strip down the center, and three are pale yellow with a slight suggestion of red brushed just at the edge of these segments.

H-39-61 is a pastel peach which is very luminous and I like it very much. H-39-129 is a very good mahogany.

Mrs. Nesmith introduced twelve daylilies in 1939 and thirty-six in 1940 at prices ranging from \$3.00 to \$20.00. Before visiting her garden I thought this was too many introductions and a number of other garden enthusiasts whom I know also felt the same way, but frankly, after seeing her garden I do not see how she can be so conservative. I believe there are between five and six hundred named daylilies at the present time. There are nineteen thousand iris. There are very few people in the United States who have ever seen a pink, raspberry, maroon or rose daylily and it seems a shame to me that hundreds of these plants which would add so much gracious beauty to some of our finest gardens should be destroyed just because one other plant is slightly superior after a microscopic examination. These rare color harmonies should be released in groups and sold to daylily enthusiasts.

In general there are three methods of introducing daylilies. The New York Botanical Society has a policy by which Dr. Stout makes crosses, and then selects his superior seedlings. After he has grown a superior plant so that he can divide it he sends a plant to Farr &

Company and he keeps a plant. If the plant under observation is worth keeping, Dr. Stout describes the plant in a horticultural year book like *Herbertia*. Farr & Company grows the plant and propagates it until they have enough plants to fill all of their orders at \$3.00 per plant before it is actually introduced. Sometimes after growing as many as five hundred plants of a given variety they will throw out all of them as not worth introducing.

This method of introducing is the conservative method. I shall always purchase anything that Dr. Stout introduces. A purchaser of a plant is more certain to get value for his investment but one disadvantage to the flower lover is that he must wait a long, long time before he can have a clone which is described. To illustrate: *Majestic* was described in Dr. Stout's book on Daylilies published in 1934. A few plants were issued by error prior to 1940. In the fall of 1940 orders on file were filled by Farr & Company at \$3.00 per one-eyed plant but the plant was still not listed for sale in their general catalogue.

The second method of introduction is used by Mrs. Nesmith. She also has thousands of beautiful seedlings. She selects her superior plants and propagates them. She introduces a plant by name when she thinks she has enough to fill all orders and this will be when she still has only a relatively few plants. Her introduction price will be from \$3.00 to \$25.00. This method will on the law of averages be more likely to offer plants which will be inferior after several years and the purchaser takes a greater risk, but on the other hand he has the joy of prompt possession of a bloom which is rare and unusual. A third method of introduction is used by confirmed amateurs who send their treasures as gifts to their friends.

I can see no reason to argue that any plan is superior or inferior to any other. It depends entirely on what the purchaser wants and can pay for. If Mrs. Nesmith can market her Daylilies for fifty dollars a plant this is a matter entirely between Mrs. Nesmith and the purchaser.

In the afternoon I went to Craemore, the garden of L. Ernest Plouf of Lawrence, Mass. Mr. Plouf is an enthusiastic collector of daylilies. He grows an unusually large number of named clones. He is also interested in hybridizing and has named five or six plants and introduced one. He had just moved his plants so that they were not typical. I did not see any field of seedlings such as I saw at the other hybridizers and most of his plants were not blooming.

I then returned to Mrs. Nesmith's home and wandered about in her garden taking notes and I stayed at the Nesmith's until late that evening when I had to take the train back to New York.

I spent the next day with Col. Edward Steichen in New York. He was formerly Chairman of the Daylily Committee and President of the American Delphinium Society but was compelled to resign both positions because of ill health. Mr. Steichen has however lost none of his interest or enthusiasm for daylilies. We spent a most pleasant and for me a profitable day discussing daylilies in general, daylily enthusiasts and objectives of the Society relative to daylilies.

I want to thank the daylily enthusiasts for a wonderful time.

2. COLOR DESCRIPTION

PRESERVING HERBARIUM SPECIMENS IN NATURAL COLORS

HAMILTON P. TRAUB, *Maryland*

The method here described undoubtedly was discovered years ago. The writer was told about it by several gardeners who had in turn received their information from others. It would be greatly appreciated if those who can cite definite literature references will report them in *Herbertia*.

During the spring of 1940 flowers of *Amaryllis belladonna* Linn. (non Herb.) were collected at Mira Flores, Orlando, Florida, in order to try out the method of preserving flowers in their natural colors that had been communicated to the writer as already indicated. The flowers were cut after the morning dew had dried for this is an important detail. The containers were new clay pots that are more porous than used ones. The flowers, placed in these, were surrounded with dry, fine sand. The flower was held in place with one hand and the sand poured in the pot with the other. The pots were stored in a dry place in the garage.

When the sand was removed early in July, the flowers were in an excellent state of preservation as far as their shape and natural colors were concerned. As the writer looks at the specimens many months later (December) the color is so well preserved that any conclusion about this point could not be very far wrong. In comparison with the pitiful state of the specimens, with reference to color, in the herbaria of Europe and America, these specimens are near perfection.

The method is easy. Sand, porous containers and a dry storage place should be available anywhere except possibly in the humid tropics. It appears that it would be worth while for curators of herbaria to consider the matter from the standpoint of providing standard equipment for the preservation of specimens, particularly the flowers, in approximately natural colors by means of this easy method.

Another important point to bear in mind with amaryllids is to include also dissected flowers so that the necessary details as to length and structure of tube, corona, insertion of stamens, etc., can be ascertained accurately by the worker in systematics. The writer cut flowers in two parts vertically on through the ovary disclosing all the important structures needed for classification and preserved them by the present method. In these the structures are in much better condition than in the case of squashed remains secured by the plant press method. For the want of a better name the writer has used the phrase, "the dry sand method", in referring to the method described above.

3. DESCRIPTION, CLASSIFICATION AND PHYLOGENY

AMARYLLIS AGLAIAE CASTELLANOS SP. NOV.

In response to the request for a contribution to 1940 *Herbertia*, dedicated to Latin America, I am pleased to comply by giving the description of a new species of *Amaryllis* that grows abundantly in and is characteristic of, the flora of the northwestern part of the Argentine (Fig. 49). In spite of this fact, its scientific name, if it has one already, is not known to me. It might be included in a description so lacking in clearness that it is not possible to place it, but that is unlikely, and I therefore propose it as a new species of *Amaryllis*. The species is an

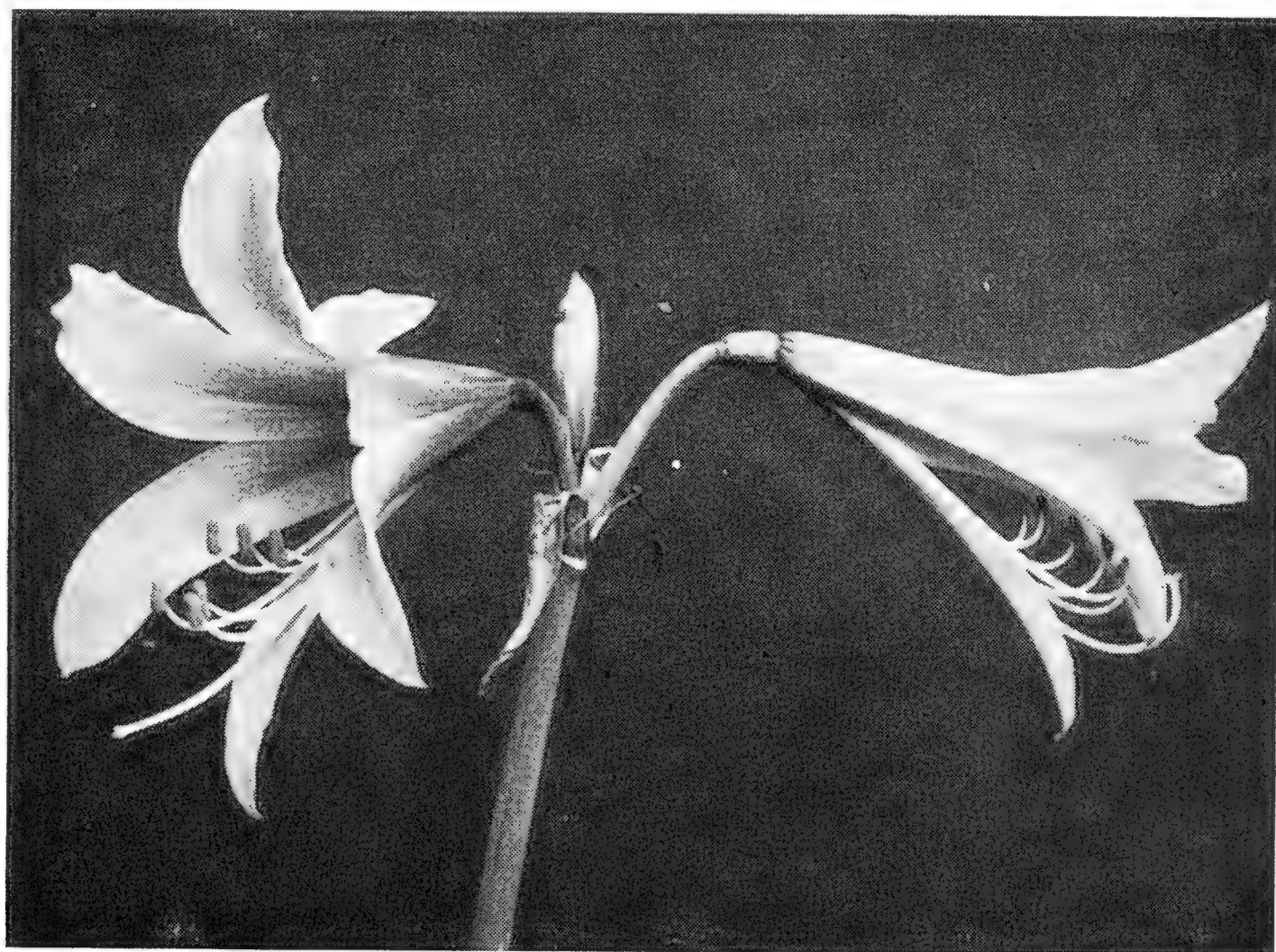


Fig. 48. *Amaryllis Aglaiae*, Castellanos sp. nov., half natural size.

important feature in the flora of the Tucuman-Bolivian botanical province, and is known locally as "The Great Amancay".

Amaryllis Aglaiae Castellanos sp. nov. Fig. 48.*

Bulb globose, 5 cm. long, 4.5 cm. diameter, the neck 7 cm. long, both blackish in color; leaves green, 20-35 cm. long, lightly channeled, fasciculate, narrowed at base, 1-2.3 cm. wide at the middle, the apex obtuse; scape glaucous, 50-52 cm. long; subcylindric, decreasing in diameter from base to apex, the greatest diameter 12 mm.; spathe bi-bracteate, papyraceous and dry at anthesis, the bracts triangular, 1 cm. broad at base, 4-4.5 cm. long; inflorescence 2- or 3-flowered; flowers

* Sr. Castellanos sent a fine colored drawing and also a black and white drawing with his description in addition to the photograph reproduced as Fig. 48 in this issue. The two drawings have been deposited in the U. S. National Museum and there they will be permanently available to the student of the Genus *Amaryllis*.—Ed.

pedunculate, horizontal or oblique, the peduncle glaucous, subcylindric, 25-45 mm. long, up to 3 mm. thick; ovary dull green, subprismatic, 6-9 mm. long, 5 mm. broad; perianth outside greenish-yellow in the lower part, the upper part butter-yellow, paler on the margins; the tube short, 5 mm. long; corona reduced to small scales bearing on the lower part the staminal filaments; sepals spatulate, acute, 7-7.2 cm. long, 2.4-2.5 cm. wide; petals similar but narrower, 2-2.2 cm. wide, the lowest, in which the filaments rest, still narrower, 14 mm. wide; genitalia shorter than the perianth, upwardly curved at the apex; stamens large, 18 mm. long, the filaments white; style longer than the filaments and equaling the

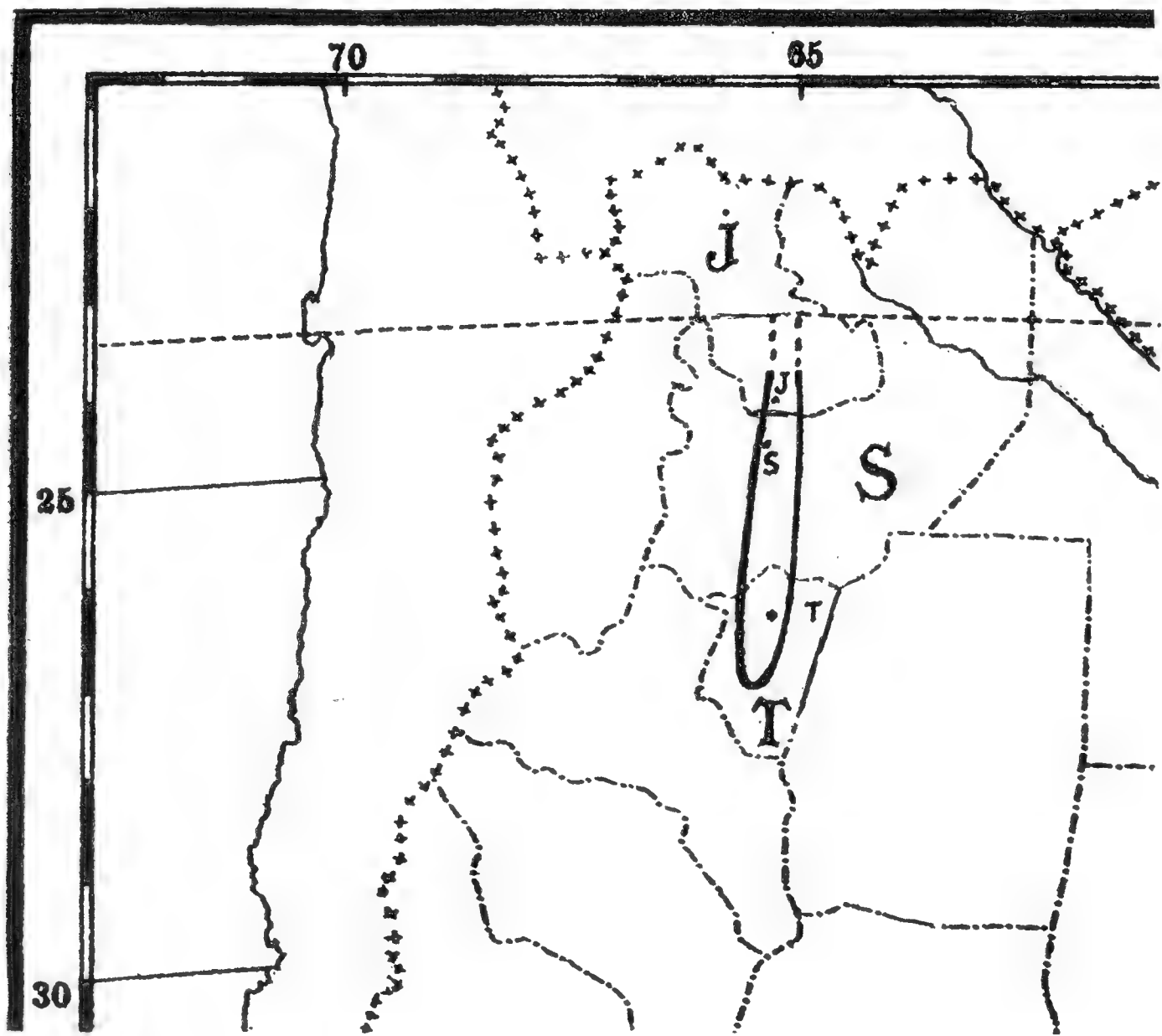


Fig. 49. Map showing geographical range of *Amaryllis Aglaiae* Castellanos sp. nov., in northwestern Argentina.

perianth segments; stigma trifid; capsule trigonous, 12 mm. high and 30 mm. broad, many-seeded, the seeds black with irregular plates; fruiting peduncle 4 cm. long and 3 mm. thick.

Amaryllis Aglaiae Castellanos sp. nov. tab. 48.

Lais, bulbi globosi, 5 cm. longi, 4.5 cm. diam., collo 7 cm. longo, uterque colore fuliginoso. Folia viridia 20-35 cm. longo, leviter canaliculata, fasciculata, angustiora in basi, 1-2.3 cm. lata in medio, cuspidate obtusa. Scapus glaucus 50-52 cm. altus, subcylindricus, decrescens a basi (diametrus maximus 12 mm.) ad verticem versus medium diametrum. Spatha 2-foliaris, papyracea et sicca per anthesim, triangularis, metiens

1 cm. in basi et quaeque pars 4-4.5 cm. longa. Inflorescentia 2-3-flora. Flores pedunculati horizontales aut obliqui, pedunculo glauco, subcylindrico 25-45 mm. longo et diametro maximo 3mm. Ovarium obscure viride, subprismaticum, 6-9 mm. longum, 5 mm. latum. Perianthium cum tubo brevi, 5 mm. longum, extus in parte inferiore luteo-subviride, in parte superiore colore luteo butyri, marginibus tantum pallidioribus; corona reducta ad squamulas minusculas, in cuius parte inferiore nascuntur filamenta staminalia. Tepala spathulato-acuta, 7-7.2 cm. longa, 2.4-2.5 cm. lata. Petala similia sed angustiore 2-2.2 cm. lata, inferius, in quo nituntur stamina, etiam angustius, tantum fasciculatum, 14 mm. latum. Genitalia breviora perianthio, apicibus sursum versus curvis; stamina filamentis albis, anteris pallidis, magna, 18 mm. longa; stylus longior filamentis et aequalis perianthio, stigmatibus 3-fido. Capsula trigona 30 mm. lata et 12 mm. alta,—seminata, seminibus atris laminaribus irregulariter formatis. Pedunculus fructus, si dehiscet, 4 cm. longus et 3 mm. diam.

Specimina examinata.—Argentina: Tucuman, Caspinchango, inter Rodeo Aspero et Rodeo Grande, leg. Castellanos 22 VII 1929. BA (Museum of Natural Sciences, Buenos Aires, Argentina)¹ no. 7237.

Notes.—When I collected this evergreen species for the first time, I thought that it might be rare in occurrence because in winter when not in flower it was not easily visible. However, during a journey that I made in the summer of 1935 into the northwestern Argentine, the contrary appeared to be true. In fact, I was impressed to note that it was never wanting in the fields of the Argentine provinces of Tucuman, Salta and Jujuy, where it is called “The Great Amancay” to distinguish it from other species of Liliiflorae that are also called “Amancay”. The bulbs that I collected at an earlier date were cultivated in the garden of the Museum of Natural Sciences, Buenos Aires, and these flowered for the first time there in November 1931. The fruits ripened well, and I obtained plants from seeds. Since that date they have flowered every year in the Museum garden.

*Museum of Natural Sciences,
Buenos Aires, Argentina.*

Alberto Castellanos

ZEPHYRANTHES FOSTERI SP. NOV.

Mr. Mulford B. Foster has made a number of plant collecting trips to Latin America and he has brought back numerous amaryllids. However, none of these have been described until now. The new species described below is of outstanding beauty and can be easily grown.

Type material.—The type specimen (Traub No. 118) has been deposited in the U. S. National Herbarium. It was taken May 1, 1940 from bulbs collected in the type locality by Mulford B. Foster, and grown at Orlando, Florida.

Description.—*Bulb* globose, 2.5 cm. in diam., 2.5 cm. high, exclusive of the neck which is 3 cm. long, and 8 mm. in diam.; tunics dark brown; *leaves* up to 5 in number, held stiffly upright, very slightly glaucous,

¹ “BA” is the abbreviation for the Museum; see *Chronica Botanica*. V (1939), 144.

concave toward center, and up to 22 cm. long, 4 mm. wide at base, 5 mm. at middle and 2.5 mm. near the acute apex; *peduncle* hollow, ribbed, tinged reddish, and up to 7 cm. high, somewhat flattened and slightly two-edged; spathe 3 cm. long, ribbed, united for 1.5 cm., apex bifid to 6 mm.; *flowers* in May and June, sessile, *color* near Rose Bengal (RHS 25/1), held stiffly upright, open in daytime and closed at night, odor not particularly pleasant; *perianth* 5 cm. long, tube 2 cm. long; *corona* of short transparent scales between the *spatulate segments* which are about 4 cm. long more or less ribbed on outer side; sepaline segments 1.5 cm. wide, petaline, 1.3 cm. wide, margins slightly incurving; ovary 6 mm. long, 4 mm. wide; *stamens* 3.2 cm. long; style 3 cm. long, *stigma* trifid; *seeds* numerous, compressed, winged.

Zephyranthes Fosteri Traub, *sp. nov.*

Bulbus globosus, 2.5 cm. diam., 2.5 cm. altus, collo 3 cm. longo et 0.8 cm. diam. excluso; tunicae fuscae; folia usque ad 5, erecta, subglaucous, concava, usque ad 22 cm. longa, basi 0.4 cm. lata, medio 0.5 cm. lata, apicem acutum versus 2.5 mm. lata; pedunculus fistulosus, rubro-tinctus, usque ad 7 cm. longus, paullo complanatus, paullo anceps; spatha 3 cm. longa, costata, marginibus 1.5 cm. connatis, apice bifida (0.6 cm.); flores sessiles; perianthium 5 cm. longum, tubo 2 cm. longo, segmentis spathulatis, 4 cm. longis, plus minusve externe costatis, segmentis exterioribus 1.5 cm. latis, interioribus 1.3 cm. latis, marginibus paullo incurvis; coronae squamae hyalinae, segmentis alternantes; ovarium 6 mm. longum, 4 mm. latum; stamina 3.2 cm. longa; stylus 3 cm. longus; stigma trifidum; semina numerosa, compressa, alata.

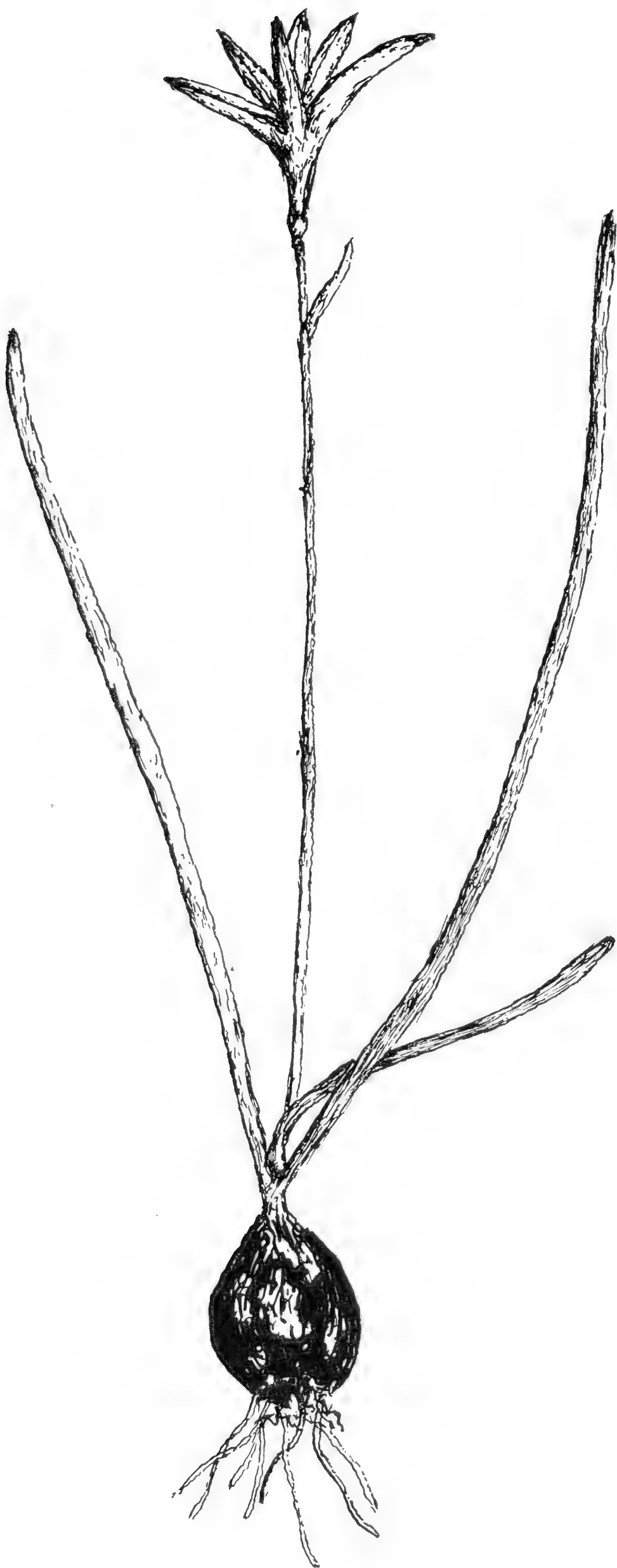
Habitat.—Type locality, near the city of Morelos, State of Morelos, Mexico; elevation about 4000 ft.; found growing near sprekelias in loamy soil, rich in humus, among rocks.

Notes.—Collected by Mulford B. Foster of Orlando, Florida, in Mexico in 1938. The species is named in his honor since we owe many new plant treasures to him. This is a very distinct species with its stiffly upright leaves and outstanding Rose Bengal colored flowers. The foliage is apparently evergreen.

—Hamilton P. Traub

Mira Flores,
Orlando, Florida,
May 1, 1940

ZEPHYRANTHES LINDLEYANA HERB.

J. C. TH. UPHOF, *Florida*Fig. 50. *Zephyranthes Lindleyana*.

When visiting various parts of El Salvador, Central America, I noticed in different towns and villages of this interesting and densely populated Republic, a small though very attractive species belonging to the Amaryllidaceae. Herbert¹ in his well known work, called it *Zephyranthes Lindleyana* in honor to Dr. J. Lindley. This bulbous plant is in that country often grown in gardens, especially along borders of herbaceous plants and shrubberies, sometimes it is found in groups in separate beds, or it is mixed with other plants, here and there in patches (See Fig. 50.).

When flowering the plant reaches a height of 12 to 20 cm. depending very much upon the elevation where it is grown. Around San Salvador, the Capital of El Salvador, in Santa Tecla and Santa Ana, regions that are situated in tropical to subtropical zones, the plants are highest. On the other hand in higher elevations, like Ahuachapan where the temperature is cool, even during the summer months, the plants are very much shorter.

The bulbs of *Zephyranthes Lindleyana* are globose, sometimes somewhat elongated and reach when fully grown a diameter of 1.5 to 2 cm. The scales surrounding the bulb are dark brown to almost black. On the

¹ William Herbert, Amaryllidaceae; 174 Plate 35, fig. 5. London 1837.

average the plant produces 2 to 5 leaves; very heavy ones produce as many as 6 to 8. They are linear and narrow, reaching almost the same length as the flower scape. The color of the perianth varies from pink to a beautiful bright red. The individual flowers are about 1.5 to 2.5 cm. in length. The stamens are nearly half as long as the limb. The stigma is three-lobed. The plants flower in the warmer sections of the country from July until August and in the higher parts of the mountainous sections I have seen them starting to flower the second half of August.

It has been reported that *Zephyranthes Lindleyana* is indigenous in certain mountainous parts of Mexico, however, I found this species also growing wild in the mountain valleys near Lake Atitlan in Guatemala, far removed from any Indian villages. I also observed the species against the higher sections of the volcano San Salvador in El Salvador. In the latter case it may be that these plants could have escaped from cultivation, because this species occurs in many gardens at the nearest homes. I also found in open spaces near the jungles farther removed from any civilization of the same mountain range, *Z. grandiflora*, which is supposed to grow there wild, and of which I know that it is not in cultivation. Its geographical distribution is much more extensive than that of *Z. Lindleyana*, for it has also been reported from other Central American Republics, Mexico and the Antilles. Both species are known in El Salvador under the name of "Jacinto."

Smith² reports the occurrence of *Z. Lindleyana* in three localities of Guatemala, namely from Naranjo in the Department Rosa at 3500 feet alt., from Cerro Redondo, Department of Santa Rosa at 4500 feet and from Patzun in the Department of Chimaltenango at 6000 feet.

From a standpoint of nomenclature there are problems that have to be solved as is apparent in the works of Hemsley,³ Lindley and others.

San Salvador, Republica de El Salvador,
September 1938.

² John Donnel Smith. Enumeratio Plantarum Guatemalensium neconon Salvadorensium Hondurensium Nicaraguensium Costaricensium. Oquawkee 4:151-152, 1895.

³ W. Botting Hemsley. Biologia Centrali-Americana. 3:333, London 1882-1886.

A CHECKLIST OF AMARYLLIDACEAE, TRIBE ALLIEAE, IN THE UNITED STATES¹

C. V. MORTON, *U. S. National Museum*

The following list includes all of the species of the tribe Allieae described from the United States.² It is intended also to list all synonyms, both generic and specific, which have been based on United States plants. This checklist does not, however, attempt a critical view of the group. Although such a revision is highly desirable, it would require extensive and detailed studies impossible to the author at the present time. A conservative treatment of the genus *Allium* would un-

¹ Published by permission of the Secretary of the Smithsonian Institution.

² Received for publication, March 26, 1937.

doubtedly reduce the number of species recognized from the western United States.

In the preparation of this list the author has been much aided by the "Flora of California" by Prof. W. L. Jepson and the "Illustrated Flora of the Pacific States" by Prof. LeRoy Abrams. There is great diversity of opinion concerning proper generic limits within the tribe. *Allium* itself, which for so large a genus is remarkably uniform morphologically, has been subdivided into no fewer than forty-three "genera." With good reason these have generally been ignored. On the other hand, the numerous genera segregated from *Brodiaea* have been based on more trustworthy morphological and habital characters. Their recognition was advocated by Dr. E. L. Greene, who has been followed by Abrams. The present list follows the more conservative system outlined by Sereno Watson, which Jepson has followed in general.

Now that the American Amaryllis Society has decided to follow Dr. J. Hutchinson in uniting the tribe Allieae with the Amaryllidaceae, it is to be hoped that the various species will obtain a wider horticultural popularity. Although they can not compete with the true Amaryllidaceae in beauty, the species of *Brodiaea* are graceful and charming and are probably susceptible of horticultural improvement.

I. ALLIUM L. Sp. Pl. 294. 1753.

Schoenoprasum H. B. K. Nov. Gen. & Sp. 1: 277. 1815.

Ophioscordon Wall. Sched. Crit. 129. 1822.

Gynodon Raf. Fl. Tell. 21; 18. 1837.

Kalabotis Raf. op. cit. 19.

Stelmesus Raf. loc. cit.

Hexonychia Salisb. Gen. 88. 1866.

Calliprena Salisb. op. cit. 89.

Validallium Small, Fl. Southeast. U. S. 264, 1328. 1903.

1. ALLIUM ACUMINATUM Hook. Fl. Bor. Amer. 2: 184. 1840.

Allium Murrayanum Regel, Gartenfl. 22:260. pl. 770, fig. 1. 1873.

?*Allium Elwesii* Regel, Acta Hort. Petrop. 5:266. 1877.

Allium acuminatum var. *cuspidatum* Fernald, Zoe 4:380. 1894.

Allium cuspidatum. Rydb. Fl. Rocky Mts. 160, 1061. 1917.

RANGE: British Columbia to northern California, east to Colorado and Montana, south to Arizona.

2. ALLIUM AMPLECTENS Torr. Pacif. R. Rep. 4:148. 1856.

Allium attenuifolium Kell. Proc. Calif. Acad. 2: 110. pl. 33. 1863.

Allium occidentale A. Gray, Proc. Amer. Acad. 7: 390. 1867.

Allium acuminatum var. *gracile* Wood, Proc. Acad. Phila. 1868:171. 1868.

Allium monospermum Jeps. ex Greene, Man. Bay Region Bot. 321. 1894.

Allium attenuifolium var. *monospermum* Jeps. Fl. W. Mid. Calif. 120. 1901.

RANGE: Washington, Oregon, and California.

3. ALLIUM ANCEPS Kell. Proc. Calif. Acad. 2: 109. pl. 32. 1863.
RANGE: Nevada, Oregon and eastern California.
4. ALLIUM ANSERINUM Jeps. Fl. Calif. 1: 274. 1921.
RANGE: Described from Goose Lake, California.
5. ALLIUM ARIDUM Rydb. Fl. Rocky Mts. 159, 1061. 1917.
? *Allium reticulatum* var. *ecristatum* M. E. Jones, Contr. West. Bot. 18: 21. 1935.
RANGE: Colorado. A doubtfully valid species.
6. ALLIUM ATRORUBENS Wats. Bot. King's Exp. 352. 1871.
? *Allium decipiens* M. E. Jones, Contr. West. Bot. 10: 16. 1902. Not Fisch. (1812).
? *Allium inyonis* M. E. Jones, op. cit. 10: 86. 1902.
RANGE: Nevada and eastern California.
7. ALLIUM AUSTINAE M. E. Jones, Contr. West. Bot. 10: 85. 1902.
RANGE: Sierra Nevada of California.
8. ALLIUM BIGELOVII Wats. Bot. King's Exp. 487. pl. 38, fig. 8, 9. 1871.
RANGE: Arizona and New Mexico.
9. ALLIUM BISCEPTRUM Wats. Bot. King's Exp. 351. 1871.
? *Allium bisceptrum* var. *utahense* M. E. Jones, Contr. West. Bot. 10: 33. 1902.
Allium tenellum Davidson, Bull. So. Calif. Acad. 21: 39. 1922.
Allium Bullardi Davidson, op. cit. 22: 72. pl. 20. 1923.
RANGE: California, Nevada, Utah and Idaho.
10. ALLIUM BOLANDERI Wats. Proc. Amer. Acad. 14: 229. 1879.
Allium stenanthum Drew, Bull. Torr. Club 16: 152. 1889.
Allium Bolanderi var. *stenanthum* Jeps. Fl. Calif. 1: 278. 1921.
RANGE: Oregon and northern California.
11. ALLIUM BRANDEGEI Wats. Proc. Amer. Acad. 17: 380. 1882.
Allium miser Piper ex M. E. Jones, Contr. West. Bot. 10: 13. 1902. (nomen).
RANGE: Oregon, Idaho, Utah, and Colorado.
12. ALLIUM BREVISTYLUM Wats. Bot. King's Exp. 350. 1871.
RANGE: Montana, Wyoming, Colorado, and Utah.
13. ALLIUM BREWERI Wats. Proc. Amer. Acad. 14: 233. 1879.
Allium falcifolium var. *Breweri* M. E. Jones, Contr. West. Bot. 10: 83. 1902.
RANGE: Central California.
14. ALLIUM BURLEWII Davidson, Bull. So. Calif. Acad. 15: 17. 1916.
RANGE: Southern California.
15. ALLIUM CAMPANULATUM Wats. Proc. Amer. Acad. 14: 231. 1879.
Allium Bidwelliae Wats. loc. cit.
Allium campanulatum var. *Bidwelliae* Jeps. Fl. Calif. 1: 274. 1921.
RANGE: California.
16. ALLIUM CANADENSE L. Sp. Pl. 1195. 1753.
Allium mutabile Michx. Fl. Bor. Amer. 1: 195. 1803.
Allium longicaule Hornem. Hort. Hafn. Suppl. 130. 1819.
Allium continuum Small, Flora Southeast. U. S. 263, 1328. 1903.
Allium canadense var. *ovoideum* Farwell, Bull. Torr. Club 42: 351. 1915.

Allium canadense var. *robustum* Farwell, op. cit. 352.

RANGE: Southern Canada and throughout eastern United States.

NOTE: Michaux misinterpreted the Linnaean *Allium canadense* and identified it with the plant now known as *Nothoscordum bivalve*. He accordingly redescribed the true *A. canadense* as *A. mutabile*, a name which has commonly been misapplied to the mid-western species here known as *A. Drummondii*.

17. ALLIUM CERNUUM Roth in Roem. Arch. 1, pt. 3:40. 1798.

Allium tricorne Poir. in Lam. Enc. Suppl. 1:270. 1810.

?*Maligia laxa* Raf. Fl. Tell. 2:19. 1837.

Gynodon cernuum Raf. op. cit. 18.

Gynodon Ellioti Raf. loc. cit.

Gynodon rupestre Raf. loc. cit.

Calliprena cernua Salisb. Gen. 89. 1866.

Allium cernuum var. *obtusum* Cockerell, Bull. Torr. Club 18:173. 1891.

Allium allegheniense Small, Bull. N. Y. Bot. Gard. 1:279. 1899.

Allium neomexicanum Rydb. Bull. Torr. Club 26:541. 1899.

Allium recurvatum Rydb. Mem. N. Y. Bot. Gard. 1:94. 1900.

Allium nutans Rydb. op. cit. 95. Not L. (1753).

Allium cernuum f. *album* Henry, Ottawa Nat. 31:56. 1917.

Allium cernuum var. *neomexicanum* Macbr. Contr. Gray Herb. n. ser. 56:5. 1918.

RANGE: Almost throughout the United States, with several well-marked variants.

18. ALLIUM Coryi M. E. Jones, Contr. West. Bot. 17:21. 1930.

RANGE: Described from Alpine, Texas.

19. ALLIUM CRATERICOLA Eastw. Leaflet. West. Bot. 1:132. 1934.

RANGE: Described from Mt. St. Helena, California.

20. ALLIUM CRENULATUM Wiegand, Bull. Torr. Club 26:135. pl. 355. 1899.

RANGE: British Columbia, Washington and Oregon.

21. ALLIUM CRISPUM Greene, Pittonia 1:166. 1888.

Allium peninsulare var. *crispum* Jeps. Fl. Calif. 1:278. 1921.

RANGE: Central and southern California.

22. ALLIUM CRISTATUM Wats. Proc. Amer. Acad. 14:232. 1879.

RANGE: Utah, Arizona and southern California.

23. ALLIUM CUSICKII Wats. Proc. Amer. Acad. 14:228. 1879.

?*Allium anceps* var. *aberrans* M. E. Jones, Contr. West. Bot. 10:10. 1902.

RANGE: Oregon and Idaho.

24. ALLIUM CUTHBERTII Small, Flora Southeast. U. S. 264, 1328. 1903.

RANGE: North Carolina to Florida and Alabama.

25. ALLIUM DESERTICOLA (M. E. Jones) Woot. & Standl. Contr. U. S. Nat. Herb. 16:114. 1913.

Allium reticulatum var. *deserticola* M. E. Jones, Contr. West. Bot. 10:30. fig. 60. 1902.

RANGE: Western Texas to Arizona and Utah. Reduced to the synonymy of *A. textile* by Rydberg but evidently distinct. It

is closer to *A. Geyeri*, but differs in its larger flowers, more conspicuous ovary crests, and usually shorter, coarser scapes.

26. *ALLIUM DICHLAMYDEUM* Greene, Pittonia 1:166. 1888.

Allium serratum var. *dichlamydeum* M. E. Jones, Contr. West. Bot. 10:84. 1902.

RANGE: Coast Ranges of California.

NOTE: According to an unpublished notation by J. B. Norton, this is typical *A. serratum*.

27. *ALLIUM DICTUON* St. John, Proc. Biol. Soc. Wash. 50:3. 1937.

RANGE: Described from Washington.

28. *ALLIUM DICTYOTUM* Greene, Pl. Baker. 1:52. 1901.

Allium pikeanum Rydb. Bull. Torr. Club 31:402. 1904.

RANGE: Colorado.

NOTE: Rydberg reduces *A. dictyotum* to the synonymy of *A. textile*, but examination of the type shows it to be the same as his species *A. pikeanum*. The relationship is with *A. Geyeri* rather than *A. textile*.

29. *ALLIUM DIEHLII* M. E. Jones, Contr. West. Bot. 10:86. 1902.

Allium tribracteatum var. *Diehlii* M. E. Jones, op. cit. 18.

RANGE: Utah.

30. *ALLIUM DOUGLASII* Hook. Fl. Bor. Amer. 2:184. pl. 197. 1838.

Allium Hendersonii Rob. & Seat. Bot. Gaz. 18:237. 1893

RANGE: Washington, Oregon, and Idaho.

31. *ALLIUM DRUMMONDII* Regel, Act. Hort. Petrop. 3, pt. 2:112. 1875.

Allium mutabile auct. Not Michx. (1803).

Allium hyacinthoides Bush, Rep. Mo. Bot. Gard. 17:119. 1906.

Allium lavandulare Bates, Amer. Bot. 22:58. 1916.

RANGE: Florida to Texas and New Mexico, north to Nebraska; also South Carolina, but very likely introduced.

32. *ALLIUM EQUICAELESTE* St. John, Proc. Biol. Soc. Wash. 44:31. 1931.

RANGE: Washington.

33. *ALLIUM FALCIFOLIUM* H. & A. Bot. Beech. Voy. 400. 1841.

Allium falcifolium var. *demissum* Jeps. Fl. Calif. 1:280. 1921.

RANGE: Southern Oregon and northern California.

34. *ALLIUM FIBRILLUM* M. E. Jones, Contr. West. Bot. 10:24. 1902.

Allium collinum Dougl. ex Wats. Proc. Amer. Acad. 14:228. 1879.
Not Guss. (1842).

RANGE: Washington and Oregon, east to Montana.

35. *ALLIUM FIMBRIATUM* Wats. Proc. Amer. Acad. 14:232. 1879.

Allium fimbriatum var. *aboriginum* Jeps. Fl. Calif. 1:273. 1922.

Allium fimbriatum var. *mohavense* Jeps. loc. cit.

Allium mohavense Tidestr. Proc. Biol. Soc. Wash. 48:39. 1935.

RANGE: California.

36. *ALLIUM FRAGILE* Nels. Univ. Wyom. Publ. Bot. 1:123. fig. 7. 1926.

RANGE: Washington.

37. *ALLIUM GEYERI* Wats. Proc. Amer. Acad. 14:227. 1879.

Allium Geyeri var. *tenerum* M. E. Jones, Contr. West. Bot. 10:28. 1902.

Allium Geyeri var. *graniferum* Hend. Rhodora 32:22. 1930.

Allium funiculosum A. Nels. Amer. Journ. Bot. 21:577. 1934.

RANGE: Washington and Oregon, east to Wyoming and south to Arizona, New Mexico, and Texas.

NOTE: A variable species, in the northern part of its range running into *A. textile*. It has been reported from farther east, but the specimens are perhaps better referred to *A. textile*. The Arizona form is *A. funiculosum*, which may be distinct. The Colorado form here listed as *A. dictyotum* is perhaps only varietally different.

38. ALLIUM GRANDISCEPTRUM Davidson, Bull. So. Calif. Acad. 23:126. 1924.

RANGE: California.

39. ALLIUM HAEMATOCYTON Wats. Proc. Amer. Acad. 14:227. 1879.

Allium Marvinii Davidson, Bull. So. Calif. Acad. 20:49. 1921.

RANGE: Coastal southern California and northern Lower California.

40. ALLIUM HICKMANI Eastw. Bull. Torr. Club 30:483. 1903.

Allium hyalinum var. *Hickmani* Jeps. Fl. Calif. 1:276. 1921.

RANGE: Coast Ranges of California.

41. ALLIUM HYALINUM Curran, Bull. Calif. Acad. 1:155. 1885.

RANGE: Sierra Nevada of California.

42. ALLIUM INTACTUM Jeps. Fl. Calif. 1:273. 1921.

RANGE: Described from Placer Co., California.

NOTE: Considered by Prof. Abrams as synonymous with *A. Sanbornii*.

43. ALLIUM KUNTHII Don, Mem. Wern. Soc. 6:82. 1827.

Schoenoprasum lineare H.B.K. Nov. Gen. & Sp. 1:277. 1815. Not
Allium lineare L. (1753).

Allium scaposum Benth. Pl. Hartw. 26. 1840.

Allium Elmendorfii M. E. Jones, Contr. West. Bot. 18:20. 1935.

RANGE: Texas, Arizona, and Mexico.

44. ALLIUM LACUNOSUM Wats. Proc. Amer. Acad. 14:231. 1879.

Allium Davisiae M. E. Jones, Contr. West. Bot. 12:78. 1908.

Allium pseudobulbiferum Davidson, Bull. So. Calif. Acad. 20:49. 1921.

RANGE: Central and southern California.

45. ALLIUM LEMMONI Wats. Proc. Amer. Acad. 14:234. 1879.

Allium anceps var. *Lemmoni* Jeps. Fl. Calif. 1:279. 1921.

RANGE: Northern California.

46. ALLIUM MACNABIANUM Regel, Gartenflora 22:261. pl. 770, fig. 2-3. 1873.

RANGE: Described from cultivated material of uncertain origin. A doubtful species.

47. ALLIUM MACROPETALUM Rydb. Bull. Torr. Club 31:401. 1904.

RANGE: Colorado and New Mexico.

48. ALLIUM MACRUM Wats. Proc. Amer. Acad. 14:233. 1879.

RANGE: Eastern Washington and Oregon.

49. ALLIUM MADIDUM Wats. Proc. Amer. Acad. 14:228. 1879.

RANGE: Oregon.

50. *ALLIUM MINIMUM* M. E. Jones, Contr. West. Bot. 10:19. fig. 36. 1902.
RANGE: Idaho.
51. *ALLIUM MIRABILE* Hend. Rhodora 32:22. 1930.
RANGE: Oregon.
52. *ALLIUM MOBILENSE* Regel, Acta Hort. Petrop. 3, pt. 2:121. 1875.
Allium arenicola Small, Bull. Torr. Club 27:276. 1900.
Allium microscordion Small, Flora Southeast. U. S. 263, 1328. 1903.
RANGE: Florida to Texas, Arkansas, and Oklahoma.
53. *ALLIUM MODOCENSE* Jeps. Fl. Calif. 1:279. 1921.
RANGE: Northeastern California.
54. *ALLIUM NEVADENSE* Wats. Bot. King's Exp. 351. pl. 38. fig. 1-3. 1876.
RANGE: Utah, Nevada, Arizona, and eastern California. Recorded from Texas, perhaps erroneously.
55. *ALLIUM NEVII* Wats. Proc. Amer. Acad. 14:231. 1879.
RANGE: Washington, Oregon and Idaho.
56. *ALLIUM NUTTALLII* Wats. Proc. Amer. Acad. 14:227. 1879.
Allium Helleri Small, Flora Southeast. U. S. 264, 1328. 1903.
Allium reticulatum var. *Nuttallii* M. E. Jones, Contr. West Bot. 12:80. 1908.
RANGE: Texas, Oklahoma, and New Mexico. Reported from Kansas, Nebraska, and South Dakota, perhaps correctly. However, this species has commonly been confused with *A. Drummondii*, *A. textile*, and even *A. stellatum*.
57. *ALLIUM OBTUSUM* Lemmon, Pittonia 2:69. 1890.
Allium parvum var. *Brucae* M. E. Jones, Contr. West. Bot. 10:12, f. 16. 1902.
RANGE: Sierra Nevada and southern California.
NOTE: According to Jepson this species is the same as *Allium parvum*.
58. *ALLIUM OXYPHILUM* Wherry, Journ. Wash. Acad. Sci. 15:370. fig. 1-2. 1925.
RANGE: Virginia and West Virginia.
59. *ALLIUM PALMERI* Wats. Bot. King's Exp. 487. pl. 27. fig. 10-11. 1871.
RANGE: Utah, Arizona and New Mexico.
60. *ALLIUM PARISHII* Wats. Proc. Amer. Acad. 17:380. 1882.
Allium Piersoni Jeps. Fl. Calif. 1:274. 1921.
Allium montigenum Davidson, Bull. So. Calif. Acad. 19:55. 1920.
Allium monticola Davidson, op. cit. 20:51. 1921.
Allium Parishii var. *Keckii* Munz, Man. So. Calif. Bot. 87. 1935.
RANGE: Southern California.
61. *ALLIUM PARRYI* Wats. Proc. Amer. Acad. 14:231. 1879.
Allium Kessleri Davidson, Bull. So. Calif. Acad. 20:49. 1921.
RANGE: Central and southern California.
62. *ALLIUM PARVUM* Kell. Proc. Calif. Acad. 3:54. pl. 13. 1863.
Allium tribracteatum var. *Andersoni* Wats. Bot. King's Exp. 353. 1871.
Allium tribracteatum var. *parvum* Jeps. Fl. Calif. 1:276. 1921.
Allium parvum var. *jacintense* Munz, Man. So. Calif. Bot. 86. 1935.
RANGE: California and western Nevada.

63. *ALLIUM PENINSULARE* Lemmon, Pittonia 1:165. 1888.
RANGE: California and Lower California.
64. *ALLIUM PLATYCAULE* Wats. Proc. Amer. Acad. 14:234. 1879.
RANGE: Oregon and northern California.
65. *ALLIUM PLATYPHYLLUM* Tidestr. Torreya 16:242. 1916.
RANGE: Oregon.
NOTE: Reduced to *A. Tolmiei* by Abrams, but an examination of the type shows it to be different.
66. *ALLIUM PLEIANTHUM* Wats. Proc. Amer. Acad. 14:233. 1879.
? *Allium pleianthum* var. *particolor* M. E. Jones, Contr. West. Bot. 10:31. fig. 61. 1902.
RANGE: Idaho, Nevada, and eastern Oregon.
67. *ALLIUM PLUMMERAE* Wats. Proc. Amer. Acad. 18:195. 1883.
RANGE: Arizona and northern Mexico.
68. *ALLIUM PRAECOX* Brandeg. Zoe 5:228. 1906.
Allium hyalinum var. *praecox* Jeps. Fl. Calif. 1:276. 1921.
RANGE: Southern California and northern Lower California.
69. *ALLIUM PUNCTUM* Hend. Rhodora 32:23. 1930.
RANGE: Oregon.
70. *ALLIUM PURSHII* Don, Mem. Wern. Soc. 6:10. 1827.
NOTE: Seemingly a synonym of *A. vineale* L., a species commonly naturalized in the United States.
71. *ALLIUM RHIZOMATUM* Woot. & Standl. Contr. U. S. Nat. Herb. 16:114. 1913.
RANGE: New Mexico.
72. *ALLIUM ROBINSONII* HEND. Rhodora 32:22. 1930.
RANGE: Oregon.
73. *ALLIUM RUBRUM* Osterh. Bull. Torr. Club 27:506. 1900.
Allium fibrosum Rydb. Bull. Torr. Club 24:188. 1897. Not Regel (1887).
Allium Rydbergii Macbr. Contr. Gray Herb. n. ser. 56:7. 1918.
RANGE: British Columbia south to Oregon, east to Montana and Colorado.
74. *ALLIUM SABULICOLA* Osterh. Bull. Torr. Club 27:539. 1900.
Allium arenicola Osterh. op. cit. 506. Not Small (1900).
RANGE: New Mexico and Arizona.
75. *ALLIUM SANBORNII* Wood, Proc. Acad. Phila. 20:171. 1868.
Allium Sanbornii var. *Congdonii* Jeps. Fl. Calif. 1:275. 1921.
RANGE: Sierra Nevada of California.
76. *ALLIUM SCHOENOPRASUM* L. var. *LAURENTIANUM* Fernald, Rhodora 28:167. 1926.
RANGE: Oregon, Colorado and New York, northward to Newfoundland and Alaska.
NOTE: This has passed in most of the recent manuals as *Allium sibiricum* L. The distinctions given by Fernald do not seem to hold true in the copious material I have examined.
77. *ALLIUM SCILLOIDES* Dougl. ex Wats. Proc. Amer. Acad. 14:229. 1879.
NOTE: The identity of this species, described from "Priest's Rap-

- ids," Columbia River, is still obscure. According to Rydberg it occurs from British Columbia south to Oregon and Idaho.
78. *ALLIUM SCISSUM* Nels. & Macbr. Bot. Gaz. 65:58. 1918.
Allium incisum Nels. & Macbr. Bot. Gaz. 56:470. 1913. Not Fomine (1909).
 RANGE: Described from Idaho.
79. *ALLIUM SERRATUM* Wats. Bot. King's Exp. 487. pl. 37. fig. 4-5. 1871.
 RANGE: Central California.
80. *ALLIUM SIMILLIMUM* Hend. Bull. Torr. Club 27:355. 1900.
 RANGE: Idaho.
81. *ALLIUM STELLATUM* Nutt. in Fraser, Cat. No. 2. 1813 (nomen); Ker-Gawl. in Bot. Mag. 38: pl. 1576. 1814.
Stelmesus stellatus Raf. Fl. Tell. 2:19. 1837.
Hexonychia stellata Salisb. Gen. 89. 1866.
 RANGE: Manitoba and Saskatchewan, south to Illinois and Texas.
82. *ALLIUM TEXTILE* Nels. & Macbr. Bot. Gaz. 56:470. 1913.
Allium reticulatum Nutt. in Fraser Cat. No. 1. 1813 (nomen); G. Don, Mem. Wern. Soc. 6:36. 1827. Not Presl (1819).
 ?*Allium reticulatum* var. *playanum* M. E. Jones, Contr. West. Bot. 12:79. 1908.
 RANGE: Idaho and Colorado, north into Alberta and Manitoba, east to Minnesota.
 NOTE: More southern forms previously identified as this species are incorrectly named, and are to be referred to *A. Geyeri*, *A. deserticola*, *A. Nuttallii*, and *A. Drummondii*.
83. *ALLIUM Tolmiei* Baker, Bot. Mag. 102: pl. 6227. 1876.
 RANGE: Washington, Oregon, Idaho and Utah.
84. *ALLIUM TRIBRACTEATUM* Torr. Pacif. R. Rep. 4:148. 1856.
Allium ambiguum M. E. Jones, Contr. West. Bot. 10:18. 1902. Not Sibth. & Smith (1823).
 RANGE: Oregon and California, east to Utah.
85. *ALLIUM TRICOCCUM* Ait. Hort. Kew. 1:428. 1789.
 ?*Allium triflorum* Raf. Med. Repos. N. Y. 5:362. 1808.
Ophioscordon tricoccum Wallr. Sched. Crit. 129. 1822.
Validallium tricoccum Small, Fl. Southeast. U. S. 264, 1328. 1903.
 RANGE: Georgia, north to New Brunswick and Minnesota.
 NOTE: Although differing rather widely from other American species *Allium tricoccum* has relatives in the Old World. There seems to be little reason for considering these plants generically distinct from *Allium*; but if so, the proper generic name is *Ophioscordon* Wallr., which antedates Small's *Validallium* by many years.
86. *ALLIUM UNIFOLIUM* Kell. Proc. Calif. Acad. 2:112. pl. 35. 1863.
Allium unifolium var. *lacteum* Greene, Pittonia 2:55. 1890.
 RANGE: California and Lower California.
87. *ALLIUM VALIDUM* Wats. Bot. King's Exp. 350. 1871.
 RANGE: Washington, Oregon, California, Nevada, and Idaho.
88. *ALLIUM WATSONI* Howell, Fl. N. W. Amer. 1:642. 1902.
 RANGE: Oregon and northern California.

89. *ALLIUM YOSEMITENSE* Eastw. Leaf. West. Bot. 1:132. 1934.
 RANGE: Yosemite Valley, California.

EXCLUDED SPECIES

90. *ALLIUM ANGULOSUM* L. Sp. Pl. 300. 1753.
 NOTE: A European species erroneously recorded from the banks of the Missouri River by Pursh.³ The plants are *A. textile* Nels. & Macbr.
91. *ALLIUM CAROLINIANUM* Delar. in Red. Lil. pl. 101. 1806.
 RANGE: Said to have come from Carolina, but according to Regel it is *Allium blandum* Wall. of Asia.

ADDITIONAL RECENT SPECIES⁴

- ALLIUM CASCADENSE* M. E. Peck, Proc. Biol. Soc. Wash. 49:109. 1936.
 RANGE: Oregon.
- ALLIUM HOWELLII* Eastw. Leaf. West. Bot. 2:109. 1938.
 RANGE: Kern and San Luis Obispo Counties, California.
- ALLIUM PERDULCE* S. V. Fraser, Trans. Kans. Acad. Sci. 42:124. 1940.
 RANGE: Nebraska to Texas.
- ALLIUM PURDYI* Eastw. Leaf. West. Bot. 2:110. 1938.
 RANGE: Described from Clear Lake, California.
- ALLIUM ROBUSTUM* Eastw. Leaf. West. Bot. 2:110. 1938. Not Kar. & Kir. (1841).
 RANGE: San Benito County, California.
- ALLIUM ROGUENSE* M. E. Peck, Proc. Biol. Soc. Wash. 49:109. 1936.
 RANGE: Oregon.

ADDENDA

Under *Allium lacunosum* include *Allium lacunosum* var. *micranthum* Eastw. Leaf. West. Bot. 2:101. 1938 following *Allium pseudo-bulbiferum*.

Under *Allium Parishii* add the following note: Since the present list was written Ewan has shown that *Allium Parishii* and *A. monticola* are distinct species. See Bull. Torr. Club. 64: 509. 1937.

II. ANDROSTEPHIUM Torr. Bot. Mex. Bound. 218. 1859.

1. *ANDROSTEPHIUM BREVIFLORUM* Wats. Amer. Nat. 7:303. 1873.
Brodiaea Paysoni Nels. Bot. Gaz. 56:63. 1913.
Brodiaea breviflora Macbr. Contr. Gray Herb. n. ser. 56:9. 1918.
Bessera breviflora Jeps. Fl. Calif. 1:291. 1921.
 RANGE: Colorado, Utah, Arizona, and southeastern California.

³ Fl. Amer. Sept. 1:223. 1814.

⁴ The following species have been described since the above list was sent in for publication. Inasmuch as the manuscript has been set up in type, it does not seem worth while to insert them in their proper places above. C. V. M. Feb. 5, 1941.

2. *ANDROSTEPHIUM COERULEUM* (Scheele) Greene, *Pittonia* 2:57. 1890.
Milla coerulea Scheele, *Linnaea* 25:260. 1852.
Androstephium violaceum Torr. Bot. Mex. Bound. 219. 1859.
Brodiaea coerulea Macbr. Contr. Gray Herb n. ser. 56:9. 1918.
Androstephium coeruleum forma *leucanthum* Benke, *Rhodora* 34:10. 1932.
 RANGE: Kansas and Oklahoma to Texas.

III. BLOOMERIA Kellogg, *Hesperian* 3:437. 1859.

1. *BLOOMERIA CLEVELANDII* Wats. Proc. Amer. Acad. 20:376. 1885.
 2. *BLOOMERIA CROCEA* (Torr.) Coville, Contr. U. S. Nat. Herb. 4:203. 1893.
Allium croceum Torr. Bot. Mex. Bound. 218. 1859.
Bloomeria aurea Kell. *Hesperian* 3:437. 1859.
Nothoscordum aureum Hook. Bot. Mag. pl. 5896. 1871.
Bloomeria montana Greene, Bull. Calif. Acad. 1:281. 1885.
 ?*Bloomeria gracilis* Borzi, Bol. R. Ort. Bot. Palermo 1:19. 1897.
 RANGE: Southern California and northern Lower California.

IV. BRODIAEA J. E. Sm. Trans. Linn. Soc. 10:2. 1811⁵ (nomen conservandum).

- Hookera* Salisb. Parad. Lond. pl. 90. 1808.
Hesperoscordum Lindl. Bot. Reg. 15: under pl. 1283. 1829.
Triteleia Dougl. ex. Lindl. loc. cit.
Calliprora Lindl. op. cit. 19: under pl. 1590. 1833.
Tulophos Raf. Fl. Tell. 3:71. 1837.
Scaduakintos Raf. op. cit. 4:23. 1838.
Dichelostemma Kunth, Enum. 4:469. 1843.
Seubertia Kunth, op. cit. 475.
Macroscapa Kell. Pacific 3:132. 1854.
Stropholirion Torr. Pacif. R. Rep. 4: 149. 1856.
Veatchia Kell. Proc. Calif. Acad. 2:11. 1863.
Rupalleya Morière, Bull. Soc. Linn. Norm. 8:317. 1864.
Dipterostemon Rydb. Bull. Torrey Club 39:110. 1912.

In this genus only the basic synonyms of species are given, rather than all nomenclatural combinations that have been made. At one time or other most of the species have been referred to *Milla*, *Hookera*, *Triteleia*, or various other genera. To include all these names would increase appreciably the bulk of this treatment without adding greatly to its value.

⁵ Since the present list was sent in for publication Mr. Robert F. Hoover has published several papers on the genus **Brodiaea**. He now recognizes three genera: **Brodiaea**, **Triteleia**, and **Dichelostemma**. Although this segregation is not here accepted, a number of changes have been made in this enumeration while in proof, in order that it may correspond with his retypification of several species and the reduction of others to synonymy. Mr. Hoover has described also several new species. The papers referred to are: "A Definition of the Genus **Brodiaea**" (Bull. Torr. Club 66:161. 1939), "Revision of the Genus **Brodiaea**" (Amer. Midl. Nat. 22:551. 1939), and "The Genus **Dichelostemma**" (Amer. Midl. Nat. 24:463. 1940). The revision of **Triteleia** has not yet been published.—
 C. V. M. Feb. 5, 1941.

1. BRODIAEA AURANTEA (Kell.) Morton, comb. nov.
Calliprora aurantea Kell. Proc. Calif. Acad. 2:20. 1863.
Brodiaea gracilis Wats. Proc. Amer. Acad. 14:238. 1879.
 RANGE: California.
2. BRODIAEA APPENDICULATA Hoover, Madroño 4:130. 1937.
 RANGE: California.
3. BRODIAEA BICOLOR SUKSD. West. Amer. Sci. 14:2. 1902.
 RANGE: Eastern Washington.
4. BRODIAEA BRIDGESII Wats. Proc. Amer. Acad. 14:237. 1879.
 RANGE: California.
5. BRODIAEA CALIFORNICA Lindl. Journ. Hort. Soc. London 4:84. 1849.
Brodiaea grandiflora var. *elator* Benth. Pl. Hartw. 339. 1857.
Brodiaea grandiflora var. *major* Baker, Journ. Linn. Soc. 11:377. 1871.
Hookera leptandra Greene, Pittonia 1:74. 1887.
Hookera synandra Heller, Bull. S. Calif. Acad. 2:65. 1903.
Brodiaea californica var. *leptandra* Hoover, Amer. Midl. Nat. 22:570. 1939.
 RANGE: California.
6. BRODIAEA CONGESTA Smith, Trans. Linn. Soc. 10:3: pl. 1. 1811.
 RANGE: Washington to Santa Clara County, California.
7. BRODIAEA CORONARIA (Salisb.) Jeps. Madroño 1:61. 1917.
Hookera coronaria Salisb. Parad. Lond. pl. 98. 1808.
Brodiaea grandiflora Smith, Trans. Linn. Soc. 10:2. 1811.
Brodiaea grandiflora var. *macropoda* Torr. Pacif. R. Rep. 4:149. 1856.
Brodiaea terrestris Kell. Proc. Calif. Acad. 2:6. 1859.
Brodiaea Torreyi Wood, Proc. Acad. Phila. 20:172. 1868.
Hookera rosea Greene, Bull. Calif. Acad. 2:137. 1886.
?Brodiaea synandra var. *insignis* Jeps. Fl. Calif. 1:288. 1922.
Brodiaea Howellii Eastw. Leaflet West. Bot. 2:111. 1938. Not Wats. (1879).
Brodiaea coronaria var. *rosea* Hoover, Amer. Midl. Nat. 22:560. 1939.
Brodiaea coronaria var. *kernensis* Hoover, op. cit. 561.
Brodiaea coronaria var. *macropoda* Hoover, op. cit. 562.
 RANGE: British Columbia to southern California.
8. BRODIAEA CROCEA (Wood.) Wats. Proc. Amer. Acad. 14:238. 1879.
Seubertia crocea Wood, Proc. Acad. Phila. 20:172. 1868.
 RANGE: Northern California.
9. BRODIAEA DISSIMULATA Peck, Torreya 32:147. 1932.
 RANGE: Oregon.
10. BRODIAEA DOUGLASHII Wats. Proc. Amer. Acad. 14:237. 1879.
Triteleia grandiflora Lindl. Bot. Reg. 15: under pl. 1293. 1829.
Brodiaea grandiflora Macbr. Contr. Gray Herb. n. ser. 56:9. 1918. Not Smith (1811).
 RANGE: British Columbia south to Oregon, east to Montana and Utah.
11. BRODIAEA ELEGANS Hoover, Amer. Midl. Nat. 22:555. 1939.
Brodiaea coronaria var. *mundula* Jeps. Fl. Calif. 1:287. 1921.
Brodiaea elegans var. *mundula* Hoover, Amer. Midl. Nat. 22:557. 1939.
 RANGE: Oregon and California.

12. BRODIAEA FILIFOLIA Wats. Proc. Amer. Acad. 17:381. 1882.
RANGE: Southern California.
13. BRODIAEA HENDERSONII Wats. Proc. Amer. Acad. 23:266. 1888
(May).
Triteleia Hendersonii Greene, Pittonia 1:164. 1888 (Feb.).
RANGE: Southern Oregon and northern California.
Note: *Triteleia Hendersonii* Greene and *Brodiaea Hendersonii* were founded on different types. Greene's name is the older, but it can not validly be transferred to *Brodiaea*. However, when the genus *Triteleia* is recognized, the correct name is *T. Hendersonii* Greene, not *T. Hendersonii* (Wats.) Greene, as given by some authors.
14. BRODIAEA HOWELLII Wats. Proc. Amer. Acad. 14:301. 1879.
RANGE: Washington and Oregon.
15. BRODIAEA HYACINTHINA (Lindl.) Baker, Gard. Chr. III. 20: 459. 1896.
Hesperoscordum hyacinthinum Lindl. Bot. Reg. pl. 1293. 1829.
Hesperoscordum lacteum Lindl. Bot. Reg. 19: pl. 1639. 1833.
Scaduakintos umbellaris Raf. Fl. Tell. 4:23. 1838.
Hesperoscordum Lewisii Hook. Fl. Bor. Amer. 2:185. pl. 198. 1840.
Veatchia crystallina Kell. Proc. Calif. Acad. 2:11. 1863.
Allium Tilingii Regel, Acta Hort. Petrop. 3, pt. 2:124. 1875.
Brodiaea lactea var. *lieacina* Wats. Proc. Amer. Acad. 14:239. 1879.
Brodiaea lactea var. *major* Purdy, in Bailey, Stand. Cycl. Hort. 1: 182. 1900.
RANGE: British Columbia and Idaho, south to southern California.
16. BRODIAEA IDA-MAIA (Wood) Greene, Pittonia 2:250. 1892.
Brevoortia Ida-maia Wood, Proc. Acad. Phila. 19:82. 1867.
Dichelostemma Ida-maia Greene, Man. Bay Region Bot. 318. 1894.
RANGE: Southern Oregon and northern California.
Note: The names *Brodiaea coccinea* A. Gray (Proc. Amer. Acad. 7:389. 1867) and *Brevoortia coccinea* Wats. (Proc. Amer. Acad. 14:239. 1879) are illegitimate and have no nomenclatural standing by Section 12 Article 60 of the International Code, for they were superfluous at the time they were proposed, being merely an arbitrary change of name because of personal dislike for the name *Ida-maia*.
17. BRODIAEA JOLONENSIS Eastw. Leaf. West. Bot. 2:111. 1938.
RANGE: Monterey to San Diego County, California.
18. BRODIAEA LAXA (Benth.) Wats. Proc. Amer. Acad. 14:237. 1879.
Triteleia laxa Benth. Trans. Hort. Soc. London II. 1:413. pl. 15. 1835.
Triteleia candida Greene, Bull. Calif. Acad. 2:139. 1886.
Triteleia angustiflora Heller, Bull. So. Calif. Acad. 2:66. 1903.
Brodiaea laxa var. *nimia* Jeps. Man. Fl. Calif. 225. 1923.
Brodiaea laxa var. *Traceyi* Jeps. loc. cit.
RANGE: California.
19. BRODIAEA LEACHIAE Peck, Torreyia 32:147. 1932.
RANGE: Oregon.

20. *BRODIAEA LEMMONAE* Wats. Proc. Amer. Acad. 20:376. 1885.
RANGE: Arizona.
21. *BRODIAEA LUTEA* (Lindl.) Morton, comb. nov.
Ornithogalum ixiioides Ait. f. Hort. Kew. ed. 2. 2:257. 1811.
Calliprora lutea Lindl. Bot. Reg. 19: pl 1590. 1833.
Brodiaea ixiioides Wats. Proc. Amer. Acad. 14:238. 1879. Not Sims (1823).
RANGE: California.
- 21a. *BRODIAEA LUTEA* var. *LUGENS* (Greene) Morton, comb. nov.
Triteleia lugens Greene, Bull. Calif. Acad. 2:142. 1886.
RANGE: California.
22. *BRODIAEA MINOR* (Benth.) Wats. Proc. Amer. Acad. 14:236. 1879.
Brodiaea grandiflora var. *minor* Benth. Pl. Hartw. 340. 1857. (nomen).
Brodiaea Purdyi Eastw. Proc. Calif. Acad. II. 6:427. pl. 58. 1896.
Brodiaea nana Hoover, Leaflet. West. Bot. 1:225. 1936.
Brodiaea minor var. *nana* Hoover, Amer. Midl. Nat. 22:566. 1939.
RANGE: California.
23. *BRODIAEA MODESTA* Hall, Univ. Calif. Publ. Bot. 6:166. 1915.
RANGE: Northern California.
24. *BRODIAEA MULTIFLORA* Benth. Pl. Hartw. 339. 1857.
Brodiaea grandiflora var. *brachypoda* Torr. Pacif. R. Rep. 4:149. 1856.
RANGE: Oregon to central California.
25. *BRODIAEA ORCUTTHII* (Greene) Baker, Gard. Chr. III. 20:214. 1896.
Hookera Orcuttii Greene, Bull. Calif. Acad. 2:138. 1886.
Hookera multipedunculata Abrams, Bull. Torr. Club 32:537. 1905.
RANGE: Southern California.
26. *BRODIAEA PALLIDA* Hoover, Leaflet. West. Bot. 2:129. 1938.
RANGE: Tuolumne County, California.
27. *BRODIAEA PEDUNCULARIS* (Lindl.) Wats. Proc. Amer. Acad. 14:237. 1879.
Triteleia peduncularis Lindl. Bot. Reg. 20: under pl. 1685. 1834.
RANGE: Northern California.
28. *BRODIAEA PULCHELLA* (Salisb.) Greene, Bull. Calif. Acad. 2:133. 1886.
Hookera pulchella Salisb. Parad. Lond. under pl. 98. 1808.
Brodiaea parviflora Torr. Pacif. R. Rep. 2:125. 1855.
Brodiaea capitata Benth. Pl. Hartw. 339. 1857.
Brodiaea capitata var. *pauciflora* Torr. Bot. Mex. Bound. 218. 1859.
Brodiaea insularis Greene, Bull. Calif. Acad. 2:134. 1886.
Brodiaea capitata var. *insularis* Macbr. Contr. Gray Herb. 56:9. 1918.
Dichelostemma pulchellum var. *pauciflorum* Hoover, Amer. Midl. Nat. 24:471. 1940.
RANGE: Oregon to Lower California, Nevada, Utah and Arizona, the var. *pauciflora* from southern California to New Mexico and Sonora.
29. *BRODIAEA SCABRA* (Greene) Baker, Gard. Chr. III. 20:459. 1896.
Calliprora scabra Greene, Erythea 3:126. 1895.
Calliprora scabra var. *analina* Greene, loc. cit.
RANGE: Southern Oregon and California.

30. BRODIAEA STELLARIS Wats. Proc. Amer. Acad. 17:381. 1882.
Hookera stellaris Greene, Bull. Calif. Acad. 2:137. 1886.
 RANGE: Northern California.
31. BRODIAEA VENUSTA (Greene) Jeps. Fl. Calif. 1:291. 1921.
Brevoortia venusta Greene, Pittonia 2:230. 1892.
 RANGE: Northern California.
32. BRODIAEA VOLUBILIS (Morière) Baker, Journ. Linn. Soc. 11:377. 1871.
Macroscapa volubilis Kell. Pacific 3:132. 1854.
Stropholirion californicum Torr. Pacif. R. Rep. 4:149. 1856.
Rupalleya volubilis Morière, Bull. Soc. Linn. Norm. 8:317. 1864.
 RANGE: California.
 NOTE: The name is incorrectly written by Jepson as *B. volubilis* (Kell.) Baker. No such combination was made by Baker, who did not transfer *Macroscapa volubilis* Kell. to *Brodiaea*, but rather *Rupalleya volubilis* Morière. It is merely a coincidence that the same specific name was chosen by both authors, for the species were described independently as new. Consequently, although *volubilis* Kell. is the oldest specific name, it is not now available under *Brodiaea*. Similarly *Stropholirion californicum* also antedates *volubilis* Morière, but the specific name can not be used because of conflict with *Brodiaea californica* Lindl.

DOUBTFUL SPECIES

33. SEUBERTIA OBSCURA Borzi, Bol. R. Ort. Bot. Palermo 1:18. 1897.
 34. CALLIPRORA ALBIDA Borzi, op. cit. 20.

V. MILLA Cav. Ic. 2:76. 1793.

Askolame Raf. Fl. Tell. 2:11. 1837.

1. MILLA BIFLORA Cav. Ic. 2:76. pl. 196. 1793.
Askolame biflora Raf. Fl. Tell. 2:11. 1837.
 RANGE: Arizona and New Mexico; Mexico. Reported from Texas.

VI. MUILLA Wats. Proc. Amer. Acad. 14:235. 1879.

1. MUILLA CORONATA Greene, Pittonia 1:165. 1888.
 RANGE: Southern California.
2. MUILLA MARITIMA (Torr.) Wats. Proc. Amer. Acad. 14:235. 1879.
Hesperoscordum maritimum Torr. Pacif. R. Rep. 4:148. 1856.
Allium maritimum Benth. Pl. Hartw. 339. 1857.
Milla maritima Wats. Bot. King's Exp. 354. 1871.
Nothoscordum maritimum Hook. f. Bot. Mag. 27: under pl. 5896. 1871.
Bloomeria maritima Macbr. Contr. Gray Herb. n. ser. 56:8. 1918.
 RANGE: California.

3. MUILLA SEROTINA Greene, Erythea 1:152. 1893.

Bloomeria maritima var. *serotina* Macbr. Contr. Gray Herb. n. ser. 56:8. 1918.

RANGE: Southern California and northern Lower California.

4. MUILLA TENUIS Congdon, Zoe 5:135. 1901.

RANGE: California.

5. MUILLA TRANSMONTANA Greene, Pittonia 1:73. 1887.

Bloomeria transmontana Macbr. Contr. Gray Herb. n. ser. 56:8. 1918.

RANGE: Nevada.

VII. NORTHOSCORDUM KUNTH, Enum. 4:457. 1843.

Geboscon Raf. Cat. Bot. Gard. Trans. Univ. 14. 1824 (nomen).

Pseudoscordum Herb. Amaryll. 11. 1837 (nomen).

Oligosma Salisb. Gen. 85. 1866.

Hesperocles Salisb. loc. cit.

1. NOTHOSCORDUM BIVALVE (L.) Britt. in Britt. & Brown, Ill. Fl. N. U. S. 1:415. 1896.

Ornithogalum bivalve L. Sp. Pl. 306. 1753.

Allium ornithogaloides Walt. Fl. Car. 121. 1788.

Allium striatum Jacq. Coll. Suppl. 51. 1796.

Ornithogalum pulchellum Salisb. Prod. 239. 1796.

Allium ornithogaloides Bosc ex Poir. Enc. Suppl. 1:265. 1810.

?*Allium hyemale* Raf. Fl. Lud. 19. 1817.

Nothoscordum striatum Kunth, Enum. 4:459. 1843.

Nothoscordum ornithogaloides Kunth, op. cit. 460.

Pseudoscordum striatum Torr. Pacif. R. Rep. 2:176. 1855.

Oligosma bivalve Salisb. Gen. 85. 1866.

Allium bivalve Kuntze, Rev. Gen. 3, pt. 2:312. 1898.

Allium bivalve var. *striatum* Kuntze, loc. cit.

Geboscon bivalve House, N. Y. State Mus. Bull. 233-234:66. 1921.

RANGE: Virginia to Florida, west to Nebraska and Texas; tropical America.

2. NOTHOSCORDUM INDORUM (Ait.) Nichols. Dist. Gard. 2:447. 1887-89.

Allium inodorum Ait. Hort. Kew. 1:427. 1789.

Allium fragrans Vent. Hort. Cels. pl. 26. 1800.

Nothoscordum fragrans Kunth, Enum. 4:461. 1843.

Hesperocles fragrans Salisb. Gen. 85. 1866.

Geboscon inodorum Thell. Mem. Soc. Cherbourg 38:168. 1912, in syn.

Geboscon fragrans House, N. Y. State Mus. Bull. 233-234:67. 1921.

RANGE: Southeastern United States and tropical America.

3. NOTHOSCORDUM TEXANUM M. E. Jones, Contr. West. Bot. 17:21. 1930.

RANGE: Arizona and Texas.

ALLIUM CORYI, M. E. JONES

H. B. PARKS

Texas Agricultural Experiment Station

Dr. H. J. Cottle (1876-1931) Biology Department, Sul Ross State Teachers College, Alpine, Texas, was one of those who early realized the immense importance of range investigation. From 1925 up to the time of his death Dr. Cottle carried on an intensive ecological investigation of range conditions in the Alpine area and at some time during that period collected on the highlands near Alpine a small yellow flowered lilaceous plant. In 1929 a popular account of the result of these range investigations was published in a San Antonio newspaper in which mention was made of the yellow flowered onion and a technical name assigned to it.

The results obtained by Dr. Cottle in his range investigation are found in a paper entitled "Studies in the Vegetation of Southwest Texas" which appeared in *Ecology* Volume 12, pages 105-155. This publication, however, did not mention the yellow flowered onion or give the name assigned to it by Cottle.

Under the date of December 1, 1929, Bulletin 3 of the West Texas Historical and Scientific Society contains a paper entitled "Contributions to the Family Liliaceae" by V. L. Cory, Texas Agricultural Experiment Station in which he states:

"In the autumn of 1927 the writer examined the specimens of a small yellow-flowered liliaceous plant that apparently was undescribed. These plants were collected in the mountains near Alpine by Professor H. J. Cottle, of the Sul Ross State Teachers College. The status of this species is not known to the writer, and a report concerning the same would be welcomed."

In "Contributions to Western Botany Number 17" Marcus E. Jones, A. M., under the date of September 3, 1930, on page 21, gives the description of a new species of *Allium*. As this publication was not widely distributed the original description is here reproduced that it may be easily available:

"*Allium Coryi*. Allied to *reticulatum* group. Growing on grassy plains at Alpine, Texas, April 26, 1930. Plants about six inches to a foot high, slender, erect, with 2-3 basal leaves half as long as peduncle which are very narrow and straight. Bulbs ovate, with very many yellowish-brown reticulated coats from which the very thin and hyaline membrane has disappeared leaving the meshwork only. Bulbs propagating by division as in *Nuttallii*. Sheaths of the umbels about as long as pedicels (1-2 inches). Pedicels slender. Flowers about 10, chrome-yellow, 3-5 mm. long, rather ovate. Perianth segments oblong-ovate triangular-acute, the outer ones with strong midrib. Ovary globose, crowned with thin and flat low crests on the angles. Odor alliaceous. One tries very hard to put this in *Nothoscordium*, but the bulbs and



H. B. Parks, San Antonio, Texas

See page 87

Allium Coryi, M. E. Jones. Clump grown from bulbs collected in the type locality.

Plate 174

color are that of an onion. This is the only native yellow onion. Anthers elliptical, on filaments nearly as long as the perianth. Dedicated to V. L. Cory of Sonora, Texas, an indefatigable botanist."

In that part of the "Contributions to Western Botany Number 18" which Jones printed on his hand press, distributed to those he considered his friends, on page 31, is found the following:

"*Allium Coryi*, Jones, I found abundant at Madera Springs on gravelly and sandy slopes on the edge of the live oaks on the north side of the Davis Mountains. The type locality was at Alpine on the southern side. The flowers are often tinged with red."

M. E. Jones is but a name to most botanists and the following is given in memory of one of the most spectacular of the West Coast botanists. He was born in Iowa almost one hundred years ago, taken west by his parents and became one of the first naturalists in the far west to connect investigation and commerce. His botanical studies of Utah and the surrounding states made him a correspondent of Gray and his school of botanists. His knowledge relative to plants, minerals, and chemistry brought him into state courts in the litigation between smelters and land owners. He was a man of strong personality and did not hesitate to express his opinion on any subject whatever. He created many enemies and a host of friends. His publications are rather numerous but are little known.

His enormous herbarium was purchased some twenty years ago by Pomona College, Claremont, California, and he was placed in charge of the same as curator emeritus. In the years that followed he made numerous long trips and secured numerous specimens and new species for the Pomona collection. During his eightieth year incited by the references to things botanical found in the publications of the West Texas Historical and Scientific Society, in the spring of 1930 he made a trip to Texas in a dilapidated automobile. On this trip he made a visit to localities mentioned in the Bulletin to which references have been made, collected the yellow flowered onion and described it as cited. The next spring Jones made another trip into Texas and Mexico and passing through Trans-Pecos Texas collected the onion a second time at Madera Springs. It is to be said in praise of Jones that he was an untiring botanist, collected many years under trying circumstances and left as a memento a magnificent herbarium at Pomona. He was the stormy petrel of Western Botany, always in the rough, and his death was an appropriate end to his tempestuous career. He was killed in an automobile accident while on a collecting trip in 1934.

In the spring of 1936, V. L. Cory and H. B. Parks of the Texas Agricultural Experiment Station made a botanical expedition through Trans-Pecos Texas. The night of April 10 was spent in the club house at Madera Springs (altitude 6400 feet). The weather was extremely dry and cold but early the next morning the entire flats around the lake were golden yellow from the blossoms of *Allium Coryi*, M. E. Jones. Abundant herbarium material was taken as well as bulbs for planting. This expedition worked southwest and *Allium Coryi* was found in the

Glass Mountains, on the mesa at the type locality south of Alpine, and in many places southwest. It was not found however in the Chisos Mountains. In no instance were plants found that showed a red color on the outside of the perianth as stated by Jones.

The bulbs were brought to the Agricultural Research Laboratory at San Antonio and immediately planted. Leaves appeared in June and remained green throughout the summer. In the spring of 1937 on March 25 three bulbs put up stems each of which bore from ten to fifteen of the beautiful golden yellow onion flowers. (Plate 174). The umbels are dense. The flowers open one at a time but the perianths persist giving a bloom of two weeks to the umbel. The seed pods are well formed by the time the perianth seres and capsules dehisce within three weeks. The plant multiplies by offsets as well as by seed. The original plantings have bloomed every spring up to date. The plants that started from one bulb now have from eight to ten and in the spring of 1939 in spite of the fact that it was the driest spring known in the San Antonio area produced many scapes of these beautiful golden flowers. This year in place of one of the scapes to a plant the cluster contained from ten to twelve. This onion has thus proven that it can stand hot dry weather and low elevation as well as a moist cool temperature and a high altitude. The plant gives excellent service as an ornamental. The scapes rise from six to eight inches and bloom through a period of two weeks. The yellow color is very pleasing and the flower is fragrant. The only drawback is the intense onion odor that broken leaves or cut stems emit. From the trial made here this plant is recommended as an ornamental. Due to the fact that no picture of this plant has appeared and that it is believed it will soon occupy a space in all bulb gardens as a new yellow flowered hardy lily the original description and picture are herewith given.

November 28, 1939.

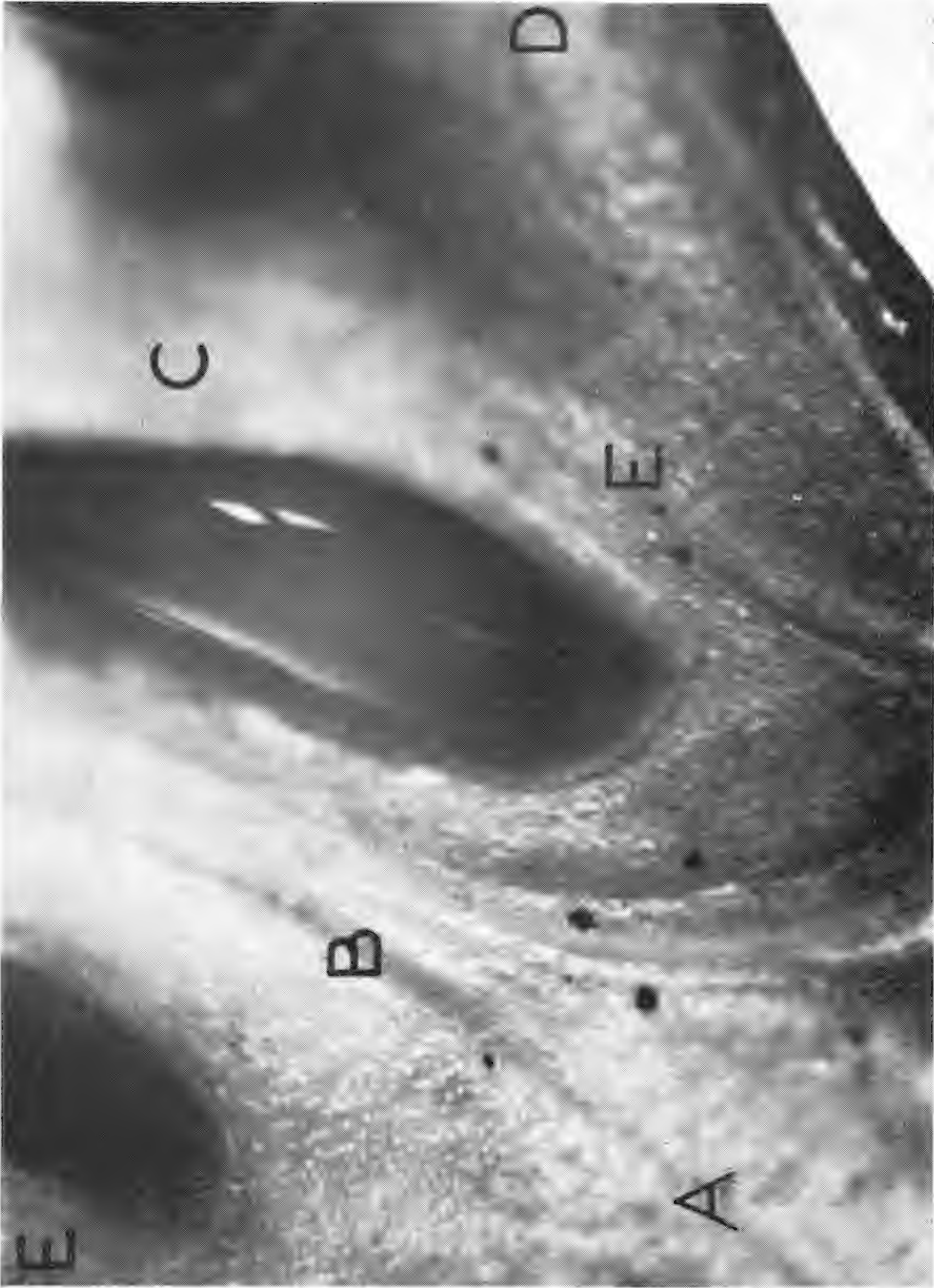
PHYLOGENETIC POSITION OF SPREKELIA

HAMILTON P. TRAUB, *Maryland*

In 1938, bulbs of *Sprekelia formosissima* were collected by Mulford B. Foster, of Orlando, Florida, on one of his plant exploration trips into Mexico. Some of these bulbs were presented to the writer who made a detailed description of the plants when they flowered, and these data are the basis of the present brief note on the probable affinity of this Genus.

Pax and Hoffman¹ have placed *Sprekelia* in the same tribe with *Amaryllis* Linn. (syn. *Hippeastrum* Herb.) where it now appears that it does not happily belong. The members of the Tribe Amarylliseae (syn. Hippeastreae) with two separate spathe valves and with usually more than one flower to the umbel are apparently more primitive, as far as these important characters are concerned, than the members of the Tribe

¹ Pax, F., and Hoffman, K. Amaryllidaceae in Engler & Prantl, Natuerlichen Pflanzenfamilien. Vol. 15a. 2nd. ed. Leipzig. 1930.



H. B. Piper
Sprekelia formosissima; photomicrograph showing portion of longitudinal section of flower; Approx. X32. A, apex of ovary; B, base of staminal filament; C, base of style; D, base of perianth-segment; E, tube.
See page 89

Zephyrantheae with spathe united into a tube for part of its length, and with usually one flower to the umbel. Apparently *Sprekelia* was classified as indicated on account of its superficial resemblance to *Amaryllis Cybister*. Baker,² for instance, claims that *Amaryllis Cybister* connects the Genus *Sprekelia* with the Genus *Amaryllis* Linn. (syn. *Hippeastrum* Herb.), but no reasons are given.

In *Sprekelia*, there is one flower to the umbel, the spathe is united into a tube for part of its length, and it differs from other Zephyrantheae mainly in having zygomorphic or irregular perianth segments. With reference to other taxonomic characters, the descriptions on record state that the stamens are declinate, and that there is no tube. However, the photomicrograph of the longitudinal section of the base of the perianth, Plate 175, shows unmistakably that there is a tube although it is very short, approximately 3 mm. long. The stamens are unequal of four different lengths as shown in Plate 187. Structurally *Sprekelia* may be described as a *Habranthus*³ with a zygomorphic perianth. With reference to the corona, *Sprekelia* shows slight development, minute scales, as contrasted with *Amaryllis Cybister*, which has a prominent incurved corona. This latter development, together with the zygomorphic segments in *Amaryllis Cybister*, indicates that it is the most highly developed species in the line of evolution represented by Subgenus *Omphalissa* within the Genus *Amaryllis*.⁴

It appears therefore that one should be careful not to confuse parallel development with close relationship. *Sprekelia* apparently represents the highest development, a climax genus, in the particular line of evolution in the Zephyrantheae rather than an offshoot from *Amaryllis Cybister* to which it has merely a superficial resemblance, the zygomorphic perianth representing only a parallel development.

BODANT HYBRID AMARYLLIS

I was asked some time ago for photographs of some of the amaryllis hybrids that we have raised at Bodant. I had two taken this year with a ruler along side, and I have pleasure in enclosing you copies thereof in case you may think them suitable for publication. I am,

Yours sincerely,
—Aberconway

Bodant, Tal-y-Cafn, N. Wales,
10th. June, 1938.

EDITORIAL NOTE. The photographs of the Bodant hybrid amaryllis are reproduced in Plate 176. We are grateful to Lord Aberconway for these very interesting illustrations.

² Baker, J. G. Handbook of the Amaryllideae. London. 1888.

³ Sealy, J. R. Zephyranthes, Pyrolirion, Habranthus and Hippeastrum. Jour. Roy. Hort. Soc. Vol. LXII, Part 5, May 1937; pp. 195-209.

⁴ Traub, H. P., and Uphof, J. C. Th. Further revision of the Genus *Amaryllis* (Linn. ex parte) (Syn. *Hippeastrum* Herb.). *Herbertia* 6: 146-154. 1939.

CRINUM FORBESIANUM

SARAH V. COOMBS, *New York*

This interesting amaryllid is, so far as I have been able to discover, not in cultivation in the United States. I should be glad to find that I am mistaken and that there may be a chance for some of us to procure fresh seeds so that the handsome flower may be seen and cultivated.

I came upon it in Africa, a patch of bright pink in a wilderness of the gray stones of some old ruins. Zimbabwe in the heart of Southern Rhodesia is a strange place, far from civilization. The ruins which lead travelers to the spot cover a wide hilltop with fortifications and the plain below with the great walls of a temple area, its cone-shaped monument, probably sacred to the Sun God, its wide meeting-places, winding corridors and inner courts. It is a remarkable group of ruins, lying in a valley among hills which are scraped so smooth that they almost shine, suggesting the action of glaciers, though South Africa has had no Ice-age. On the tops of the hills are stone figures, some of which resemble human beings and animals, the shapes the result of erosion. One, which looked like an antediluvian beast or bird, was my guiding mark when I botanized through that wild country, rich in flowers of great interest. After wandering and botanizing for an hour or two through thickets of mimosa and other trees of the "Thorn Bush" type, I would come out into a small clearing and my beast on his hilltop would tell me where I was, a true favor, since getting lost is my easiest game. Each time the creature had a different expression, as seen from different quarters. Sometimes he looked fierce, sometimes he was just non-committal but often he had an odd, sinister grin, so that I came at last to have an almost superstitious feeling about him.

The place was strange, the great ruins unexplained. Even the sunlight, though brilliant, had a metallic quality, green-yellow and hard. Though the buildings have been ascribed to eight different races or nationalities, Persians, Arabians, Phoenicians, Syrians, etc., and each theory has its advocates, I like to hope that the question will never be settled beyond doubt as to the builders of those twenty-foot walls. My beast did finally seem to be telling me that the valley and its ruins should be left to the spirits of the race who did such a marvellous piece of work and that white people with their notions were out of place. The foolish feeling grew on me and truly fascinating as the place was and much as I was excited by it and the wonderful variety of flowers, I was not sorry to go, when the time came. Among the specimens I brought back were those of a small gladiolus which the experts were unable to identify. It was probably a new species. Zimbabwe was queer even to the last for the long night drive to catch a midnight train on the branch railroad was through a wild country which had leopards and lions and other fierce beasts, the only human habitations being a few native kraals.

It was when I was wandering quite alone one day through the ruins outside the temple walls, ruins probably those of the homes of the priests or temple attendants, with few traces of vegetation just there



Lord Aberconway, Bodant, N. Wales

See page 89

Hybrid Amaryllis raised at Bodant with ruler along side to indicate size; upper, approx. 7 inches wide; lower, 9 inches wide.

except some tree euphorbias and a few small succulents, that my eye was caught suddenly by a gleam of pink. The flower-cluster was gorgeous, 20-30 great trumpet-shaped flowers and buds, 7-8 inches long, pink with a broad crimson line down the outside of the segments and with long prominent stamens. The scape was short, stout, less than a foot long. The leaves had not developed. The spathe-valves were triangular, red-tinted, 3-4 inches long. Both the *Flora Capensis* and Lt. Col. Grey speak of the flower as white with a crimson streak, but my impression of the flower and the description I wrote at the time was of a pink flower and I have the same impression of ones which I saw growing in the Botanical Garden at Kirstenbosch, later.* There may be variations in color, or those I saw, if white in background, were heavily overlaid with pink or crimson.

I resolved to have some of the bulbs so when I went back to the small hotel where I was the only guest, I asked the proprietor if he could find some for me. He assented and sent two of the native boys to dig some of the "pink lilies" for me. I was leaving that night and was traveling with suitcases, cameras, herbarium specimens, a large roll with plants, a typewriter, etc., and though I looked when en route rather like the natives who carry their bedding when they travel, I was ready for any adventure but I admit that when I saw the bulbs, my heart misgave me. There were four of them and they were as big as my head! I knew there would be in that wild place neither paper nor box. However, I knew also that I would take them if I had to tie them with cord and hang them around my neck so it was just a question of finding the best way.

At that moment, as I was gazing at them, the man spoke up: "I have just remembered", he said, "you can't take any plant out of Southern Rhodesia, because we have a quarantine for foot and mouth disease" and alas! it was so. At that particular time, the quarantine was very strict and I had to leave my lovely "pink lilies" behind. I tried in every way later, in Johannesburg and Cape Town to have the rule lifted so that I could send for them but to no avail. Even to have them sent O.H.M.S. (On His Majesty's Service) to the Botanical Garden at Kirstenbosch and share them was not possible so they are still in Southern Rhodesia and I hope they were replanted as was promised. I received some seeds from Kirstenbosch later but they did not sprout. I shall always regret that I had to leave the splendid bulbs behind.

CRINUM ERYTHROPHYLLUM

WYNDHAM HAYWARD, *Florida*

Crinum erythrophyllum, Carey, is the name of the species which is the subject of this note. This species is recorded by William Herbert on Page 258 of his *Amaryllidaceae*, 1837, and the reference given is as follows: "Bot. Mag. 47.2121. p. 7. Ex Rangoon, foliis saturate sanguineis. Dr. Carey lost this remarkable plant without having seen its

* See Plate 53, *Herbertia*, Vol. 4. 1937.



R. B. Piper

See page 95

Amaryllis procera; plant that bloomed at Orlando, Fla.

flower, and vainly attempted to obtain it and *Macrocarpon* again. There is no doubt of its being a distinct species, but I cannot tell what are its affinities. Leaves as red as those of a red cabbage." J. G. Baker disregards this species entirely in his treatment of the *Crinums* in his *Handbook of the Amaryllideae*, 1888.

In 1934 the writer obtained a shipment of mixed *Crinum* bulbs from the nursery firm of Hla Maung Bros., Rangoon, Burma, several hundred bulbs in all. Of these, more than 100 proved to be the red leaved *Crinum* recorded by Carey and Herbert, but otherwise unknown so far as ascertained by the writer.

Several of these bulbs bloomed in the summer of 1935, but they proved to be a difficult subject, as Carey experienced in the first place, according to the Herbert quotation. Instead of establishing themselves they grew smaller and smaller, and in four years time, not a single bulb survives at Lakemont Gardens. However, specimens were sent to the New York Botanical Garden,* Maj. Albert Pam,* Wormley Bury, Herts., England and to the late Al. G. Ulrich, St. Louis, Mo., so it is hoped that it may still be in cultivation with them.

The bulbs of *Crinum erythrophyllum* had short, curling, sprawly leaves, not over a foot long and an inch to two inches broad and narrowing to a point. The bulbs were small, to 2½ or 3 inches in diameter. The foliage was wine colored in full light. The flowers were on a slender scape, about pencil size, under a foot in height, with three or four white flowers, having long (3 to 4 inches) linear-lanceolate petals, much like *Crinum pratense* and varieties.

SPATHES OF AMARYLLIS PROCERA

HAMILTON P. TRAUB, *Florida*

In 1938, Mr. E. J. Anderson of Palm Beach, Florida, presented to the Society two bulbs of the Blue Amaryllis, *Amaryllis procera*, from a lot that he had imported from Brazil (See Plate 190). We had attempted to grow this species before and apparently we made every possible cultural mistake. After some complete failures, it was noticed that plants given partial shade began to thrive and grew intermittently throughout the year in the open in Florida. Finally the plants in partial shade were placed under a frame covered with window-screen to keep out the Lubber grasshoppers. They continued to grow on satisfactorily. From these experiences we concluded that this species should be given partial shade.

When the bulbs from Mr. Anderson arrived, we were prepared. They were planted in a large clay pot in a soil mixture of ½ granulated peat, ¼ sharp sand, and ¼ compost. To this mixture a few handfuls of coarsely ground charcoal and oyster shell were added. The plants were placed in a cool greenhouse with all glass painted with whiting except the north side so that they received no direct sunlight. Under

* Will those who have received these bulbs please report. Photographs of the plant in flower are wanted for *Herbertia*. —Ed.

these conditions, the plants thrived and pleasantly surprised us in early April when one of the bulbs flowered as shown in Plate 177. The plants were then placed in the Orchid House at the Mead Botanical Garden, Orlando-Winter Park, where the public had the opportunity of viewing it.



Fig. 51. *Amaryllis procera*; portion of specimen (Traub No. 119) showing four spathes—two large and two smaller.

It was noticed at once that there were more than two spathes—two larger and two smaller—as shown in Fig. 51. Apparently the description of the Genus *Amaryllis* (Sealy, J. R., Jour. Roy. Hort. Soc. Vol. LXII: 195-209, 1937) must be amended in this particular if this species

is to be accomodated. It would be worth while to re-examine the other species of *Amaryllis* from the standpoint of the number of spathe valves. I have a vague memory of seeing some hybrid amaryllis with more than two spathes, and it may well be that some of the other species from which they were derived may show similar variation.

Even if this character could be established as distinctive for this species, it would not be of sufficient weight to warrant the elevation of the Subgenus *Worsleya* to the rank of a genus. However, if such a character were distinctive and were reinforced by differences in seed character, seed maturation time, and leaf shape, the sum total might be sufficient to establish a new genus. However, for the present no change is proposed in order that the whole Genus *Amaryllis* may be studied further before making a final decision.

AMARYLLIS BLUMENAVIA

HAMILTON P. TRAUB, *Florida*

We are indebted to the Division of Plant Exploration and Introduction, Bureau of Plant Industry, U. S. Department of Agriculture, for a number of fine amaryllids. A few years ago, the Society received, among others, bulbs labeled P. I. 118814, *Hippeastrum breviflorum*, from Mr. Morrison for the trial collection. In 1940, this introduction flowered in Florida, Plate 178, and this event is the subject of this brief note.

The plant, Plate 178, corresponds fairly well with Sealy's description of *Amaryllis blumenavia*, including the seed character, (Curtis's Bot. Mag. tab. 9504. 1937; Herbertia 6:153-154. 1939), except in the shape of the bulb and leaf, and the relative freedom of the spathe valves. A summary of these differences is presented in the following table:

<i>Character</i>	<i>Amaryllis Blumenavia</i>	<i>P. I. 118814</i>
Bulb	globose	subglobose
Leaf shape	petioled	lanceolate
Freedom of spathes	split to base	not split entirely to base

Although the differences are somewhat marked in the characters cited above, it appears that this plant represents merely a variety of *Amaryllis Blumenavia*. Numerous species have been described in Amaryllidaceae on the basis of lesser differences than these, but this should be discouraged in the future. It is to be hoped that the time will come when such variations as these will be considered as showing evolutionary tendencies within the species rather than well established self perpetuating groups entitled to specific rank.



R. B. Piper

See page 96

Amaryllis Blumenavia

OFFICIAL DATA CARD FOR HEMEROCALLIS *

J. MARION SHULL, *Maryland*

Interest in the Daylily, or *Hemerocallis*, has grown by leaps and bounds in recent years and is still growing. The number of breeders now working with this interesting material have so multiplied their numbers and so extended the variation of color and form and habit of growth that ordinary methods of description have broken down, are no longer adequate to provide the desired means of comparison or differentiation.

This happens in any plant group under similar circumstances, and the daylily has now reached that stage where some uniform scheme of registry and description is necessary if useless and confusing duplications are to be avoided.

Already the leading commercial catalogs dealing with *Hemerocallis* present many descriptions that do not sufficiently differentiate. Sometimes the same clone will be described on the basis of different salient features, or again two distinct clones may be described only to the extent of features in which they are similar and the reader is correspondingly confused or left unenlightened.

The data card here presented is designed to provide quick and accurate reporting of all clones on a basis that will permit instant close comparison one with another. To use the card it is only necessary to underscore the appropriate descriptive word, or if it is desired to indicate a position intermediate between them the underscore simply passes from one to the other. By this means a highly accurate description is available for quick reference. Where added information seems desirable it can be covered in the ample space left for remarks. To show how simply and accurately the Data Card operates, and to introduce its use to those working with *Hemerocallis*, Dr. Traub has kindly contributed one with nearly complete marking descriptive of his variety, *La Tulipe*. This is reproduced herewith as an illustration (Plate 179).

This data card is reasonably self explaining but what follows may help to secure a uniform and unhesitating interpretation. Name of clone is placed in upper left corner of the card, on both sides to serve as a guide for alphabetic filing and easy reference.

Under "growth" the plant as a whole in its vegetative performance is described. Weak growers will only seldom be listed, for unless some extreme merit of flower, blooming season, or what not, justifies perpetuation such weak growers should never be retained. "Habit" deals with the making of long or short rhizomes or runners, the former resulting in such aggressive spreading as shown in *Europa* and *Margaret Perry*,

* The data card for daylilies here represented, prepared by J. Marion Shull, a member of the Daylily Committee, was officially adopted by the Board of Directors of the Society in 1940. This data card fills a long felt want, and Mr. Shull is to be congratulated on his excellent job. It is recommended that such a card properly filled out accompany each new request for registration, and that it be used to describe clones generally so that all descriptive work will be on a comparative basis.—Ed.

AMERICAN AMARYLLIS SOCIETY OFFICIAL DATA CARD—HEMEROCALLIS

NAME La Tulipe WHERE GROWN Orlando, Fla.
 ORIGINATOR H. P. Traub INTRODUCER same YEAR 1939
 PARENTAGE Secured by using mixture of 25 or more pollens.
 GROWTH—Weak, moderate, vigorous. Habit: spreading, compact. Roots: fleshy, slender, cylindrical, fibrous; long, short. Rate of increase: slow, rapid. Height of foliage mass 1 1/2 ft.
 FOLIAGE—Erect, arching, recumbent; slender, broad; yellow-green, blue-green; evergreen, deciduous.
 SCAPE—Erect, drooping; slender, heavy, graceful stiff. Branches: none, few, many compound.
 Height 2 1/2 ft. No. of buds 6-8 Season: early, medium, late. Bloom periods 2
 Date 1st bloom mid Apr., last Late June
 FLOWER (as a whole)—Large, medium, small. Single, double. Front view: spidery, star-like, full. Side view: funnel, wide spread, recurved; regular, irregular, bizarre. Blooming: day, night, extended.
 Diameter as naturally standing 3" in. Fragrance: wanting, pronounced; pleasant, unpleasant.
 Carriage: vertical, horizontal. Fading, sun resistant. Quick shedding, persistent.
 *COLOR—Self, bicolor, polychrome, blend. Color effect in mass dark cardinal 6-2-8
 Segments: Petals _____ in. long; _____ in. wide. Color "lighter dark cardinal"
 # Sepals _____ in. long; _____ in. wide. Color lighter dark cardinal
 Color of throat sulfur yellow Color of eye zone scarcely perceptible
 REMARKS † Flower vase shaped, and longer than wide;
Size of segments not determined so far
 SUBSTANCE—Thin, medium, heavy. TEXTURE—Smooth, crinkled, spangled.
 CHIEF MERITS OR OUTSTANDING QUALITIES. (OVER)
Cl. e with distinct growth habit & flower shape

NAME La Tulipe AWARDS 1st. class certificate
AAS 1940

REMARKS IN GENERAL:

Beautiful and outstanding, but is most important for further breeding work;
Fades somewhat in late afternoon in full sun, and should be given partial shade for best results.

* Refer to A Dictionary of Color by A. Maerz and M. R. Paul or to Royal Horticultural Society Colour Chart, when possible.

NAME OF PERSON REPORTING H. P. Traub
 DATE 11-15-40 ADDRESS U.S. Hort. Sta., Beltsville, Md.

For full description of card read article by J. Marion Shull in 1940 *Herbertia*. Fill in blank spaces and underline words which describe daylily named. Please give FULL INFORMATION. Return completed card for registration to ELMER A. CLAAR, Chm. Daylily Comm., 1301 Chestnut Ave., Wilmette, Illinois. (OVER)

Official Data Card for Hemerocallis, actual size 3 inches by 5 inches, showing front and reverse sides; filled out for the clone, **La Tulipe**. This shows how simply and completely the description can be made despite the small space allotted. Note under "Foliage" how a medium or intermediate width of leaf is indicated; and again under "Flower," the intermediate condition as to sun resistance, which is further re-enforced under "Remarks in General."

The data were taken from a garden diary, and the card is not completely filled out, lacking the length and breadth measurements of flower segments. Nor is the seed parent indicated under "Parentage." In this case the fact is unknown.

a trait that makes these and similar clones undesirable in the intimate garden, but great for broad landscaping, whereas those with short rhizomes form compact clumps that may remain many years with very slight encroachment on neighboring garden freeholders. Root characters are of less immediate importance in the garden but may help in identification of clones.

“Rate of increase”, the rate of multiplication of new fans, varies no doubt partly with soils and climatic conditions but it is also a matter of hereditary difference. With me *George Yeld* is very slow of increase and *Mikado* quite the reverse.

Height of foliage mass does not refer to length of leaves but to the naturally standing mass which is of importance in landscape effect. Foliage may stand stiff and erect or may arch over gracefully, or it may actually sprawl, and these attitudes, with the difference in normal color from yellow- to blue-green are of significance in the garden plan. Some remain with reduced but still green foliage throughout the winter and so are characterized as evergreen whereas clones like *H. Middendorffii* disappear entirely even by late summer and have earned the descriptive term “deciduous”.

There is great variation in the scape or flowering stem. Of course all will lean over away from nearby shade and toward the light but even in the open some will arch over instead of standing erect, even to the extreme of sprawling indicated by “recumbent”. Some stems are slender and wiry, others thick, and either may be stiff or graceful in carriage. Branching may go all the way from capitate (wanting) as in *H. Middendorffii*, to compound as in *Queen Mary* and the multifloras. Compound branching is a prime quality for on this depends the number of blooms that may be out at one time as well as the total number of flowers per scape. Number of buds (flowers) will naturally be set at the maximum by the person reporting and this is all right except that stems obviously abnormal, such as may sometimes result from fasciation or possibly from frost injury, should not be made the basis of bud count.

In the lower south some clones bloom repeatedly and even in more northern latitudes some at least occasionally bloom a second time, so provision is made for noting this feature under “blooming periods”, but this is not to be confused with date of first and last bloom in locality where reported.

It is not possible to cover every variation of flower character but the principal characteristics are here included. By “spidery” is meant a flower whose segments are long and strap-like. With somewhat wider and pointed segments the flower becomes “star-like”, while the term “full” has long been in use for flowers with broad or decidedly overlapping segments. This description is further augmented under petals and sepals where provision is made for actual measurement of length and width.

The “side view” is more variable but several main attitudes are provided for on the way from a narrowly open *Cissy Giuseppe* to the wide-spread and recurved *Shirley*. Aside from the general aspect there

may be great irregularity of carriage owing variously to a long thrust-out lower segment, an unusual angle of flower face, the twisting or curling of segments, or something of a hose-in-hose effect where petals and sepals bend back at different levels. Clones like *Ophir* and *Sir Michael Foster* are quite regular but *Wau-bun* and others may be designated as "irregular" or even "bizarre" with added mention under "remarks" when desirable.

Under "blooming" reference is had to the time of day during which flowers are effective. Day bloomers are those that open in the morning and close by evening or night and include the great bulk of effective garden varieties. Even among these there is considerable variation. *Europa* is a sleepy-head, not well open till around nine o'clock, and retires fairly early in the evening. Many others open during the night, greet the break of day fully out, and remain in full display till after dusk. Others like *Calypso* open in the afternoon or evening and remain till ten o'clock or noon of the following day, dependent somewhat on light and temperature. These are the most useful of the night bloomers. An occasional night bloomer operates only at night and over a short period, not open until dusk and gone before morning, and are only useful for gardens enjoyed at night or for cut flowers at night, when most daylilies are a dead loss. For those few whose periods extend twenty-four hours or more the term "extended" is used.

"Carriage" covers flower position relative to the stem and is almost though not quite as varied as in the true lilies.

Many daylilies bleach or fade in hot bright sunshine. Lemon yellow may bleach to near white by midafternoon—but that does not warrant describing them as "white" daylilies. Darker colors are more likely to suffer because they absorb more heat than do lighter colors. These are apt to fade to more nearly the color of manilla wrapping paper. In a few cases the so-called "pink" daylilies become more nearly pink in late afternoon than in the morning—may in rare instances be a lovelier color than before fading. Others both dark and light remain practically unaffected by the sun. A clone need not be discarded because it lacks resistance to strong sunshine but this weakness needs to be known and the variety given a position in whole or at least partial shade.

After blooming, those clones are most useful that drop their spent flowers quickly so provision is made for recording desirable quick shedding or indicating the persistence of spent flowers which gives a messy, unclean appearance unless deliberate care is taken to remove them day by day.

Under "Color" four general types are recognized; the selfs in which there is no marked variation from one color throughout the segments. Clones like *Hyperion*, *Goldeni*, *Ophir*, are typical selfs, the greenish tone at throat not voiding the term. "Bicolor" best applies to those wherein the color of petal segments is notably different from that of the sepals. With several distinct colors prominent in the same flower the term "polychrome" is correct. "Blend", on the other hand is not so definite. It can only mean a more or less actual blending of such

colors as occur habitually in daylilies, where the colors do not stand out clearly against each other or in definite patterns. It can not be specific as in *Iris* where "blend" means the combining of yellow with anthocyanin purples. Still it will be a useful descriptive term in certain cases. Special pattern or peculiarities of color arrangement must be left for inclusion under "remarks".

When possible the color of petals and sepals should be recorded in terms of a standard color nomenclature,* but aside from these more minute details a given variety will possess a mass color value, as lemon yellow, golden, orange, brown, etc., in garden effect, and for this reason a place is provided for recording this broader statement of color. A *Mikado*, despite its striking petal spots, may still classify as yellow in mass.

In some varieties the throat color is quite distinct and in many there is a heightening of color on petals just beyond the throat producing a roughly circular or triangular eye effect that has come to be known as the "eye-zone". It may be so faint as to be scarcely distinguishable or it may be very pronounced. It may be an enhancement or a detracting but in either case it provides a useful mark of varietal differentiation and when distinctive needs to be included in the description.

Substance and texture may seem of minor importance in a flower that lasts but a day. However, texture, the peculiar variations of flower surfaces, may be of considerable value at close range, where the spangled or gold dust effect, or a pattern of intricate crinkling may be fully appreciated.

The card still leaves some voids, such as the occasional distinctive midrib, the color of unopened buds, or the differing color of the outer surfaces of segments, but these rarer items can be best be taken care of under "remarks".

For the sake of future development it would be desirable to have all older clones subjected to the uniform description made possible by this data card at as early a date as possible, and then it might be well to stipulate that a properly scored card be filed with each new request for registration.

DAYLILIES RATED FOR GARDEN VALUE, SEASON 1939

GEORGE DEWITT KELSO, *Rhode Island*

[After making a particularly brave fight over an extended period, Mr. George DeWitt Kelso passed away on February 8, 1940. Before his death, he completed with great effort the following Daylily Report for 1939. Much credit is due him on account of his will power for he could often work only a few minutes at a time. All who knew him feel a great personal loss in the passing of this fine personality who radiated friendship, and never lost his youthful enthusiasm. Mr. Kelso's passing means a great loss from the standpoint of the advancement of *Hemerocallis*.

* "A Dictionary of Color" by A. Maerz and M. R. Paul; or the "Royal Horticultural Society Colour Chart."

He not only *pioneered* in making the first attempts in evaluating day-lilies, but also kept up an unflagging interest in this field as indicated in this the fourth symposium rating of daylilies.—Harold S. Tiffany, Waltham, Mass., March 1, 1940.]

The numerical values assigned to the letters indicated in the tables presented are as follows: A=9.5 (Excellent); B=8.5 (Good); C=7.5 (Fair); and D=6.5 (Discard). Forty growers participated in the symposium, and 248 clones were rated—124 clones in commerce for a number of years, and 124 clones, mostly recently introduced clones, written in by voters.

TABLE 1. Rating of daylilies for garden value; comparison of ratings of the first ten standard clones for the past four years. Prepared by George DeWitt Kelso, Providence, R. I.

1939—124 clones; 40 persons participating					
	Rating	Votes			
		A	B	C	D
*1. Mikado (Stout)	9.39	33	4		
*2. Hyperion (Mead)	9.36	31	5		
3. Patricia (Stout)	9.34	23	2	1	
4. Bagdad (Stout)	9.21	22	7	1	
5. Rajah (Stout)	9.21	16	4	1	
*6. Ophir (Farr)	9.20	27	9		
7. Anna Betscher (Betscher)	9.20	21	9		
*8. George Yeld (Perry)	9.16	23	5	1	1
*9. Wau-Bun (Stout)	9.08	22	11		
10. Maculata	9.08	11	12		

1938—321 clones; 25 persons participating					
*1. Mikado (Stout)	9.45	20	1		
2. Patricia (Stout)	9.37	15		1	
*3. Hyperion (Mead)	9.33	20	4		
*4. Ophir (Farr)	9.32	16	6		
5. Anna Betscher (Betscher)	9.21	15	6		
6. Golden Dream (Betscher)	9.13	12	7		
*7. Wau-Bun (Stout)	9.13	12	7		
*8. George Yeld (Perry)	9.13	14	4		
9. Bagdad (Stout)	9.10	10	4	1	
10. Sunny West (Sass)	9.07	11	1	1	1

1937—163 clones; 8 persons participating					
1. Bijou (Stout)	9.5	4			
*2. Mikado (Stout)	9.5	6	1		
*3. Ophir (Farr)	9.1	6	1	1	
4. Pale Moon (Cleveland)	8.9	3	1	1	

*5. George Yeld (Perry)	8.8	5	2		1
6. Cressida (Betscher)	8.7	4	2	2	
*7. Wau-Bun (Stout)	8.6	1	5		
*8. Hyperion (Mead)	8.6	5	2		
9. Golden Dream (Betscher)	8.6	3	2	2	
10. Mrs. A. H. Austin (Betscher)	8.6	4	1	3	

1936—21 clones; 9 persons participating

*1. Mikado (Stout)	9.4	7	1		
*2. Hyperion (Mead)	9.4	7	1		
*3. Ophir (Farr)	9.3	6	1		
4. Golden Dream (Betscher)	9.3	6	1		
*5. George Yeld (Perry)	9.1	5	1	1	
6. Goldeni (Betscher)	9.0	4	1	1	
*7. Wau-Bun (Stout)	8.9	5	3	1	
8. Cressida (Betscher)	8.9	4	2	1	
9. Radiant (Yeld)	8.7	2	2	1	
10. Soudan (Stout)	8.5	1	4	1	

TABLE 2. Evaluation of 124 standard daylily clones; sponsored by Roger Williams Park, Providence, Rhode Island, and Waltham Field Station, Massachusetts State College, Waltham, Mass.; Compiled by George DeWitt Kelso, 100 Fountain Street, Providence, R. I.; 40 growers participated; season 1939.

Clone	Total Vote	Rating	Votes			
			A	B	C	D
A. E. Kunderd	6	7.5	1	1	1	3
Ajax	17	8.44	5	9		3
Amaryllis	24	8.62	8	13	1	2
Anna Betscher	30	9.20	21	9		
Apricot	24	9.04	13	11		
H. Aurantiaca	13	8.27	3	7		3
Aurantiaca major	11	8.50	4	5		2
Aureole	20	8.40	4	13		3
Bagdad	30	9.21	22	7	1	
Bardeley	17	7.73	2	7	1	7
Bay State	23	8.41	7	11	1	4
Beacon	6	8.66	3	2		1
Bijou	27	9.05	16	10	1	
Burbank	9	7.83	1	4	1	3
Byng of Vimy	17	8.55	8	5	1	3

* Clones starred in this table appear among the first 10 in all four years.

Clone	Total	Votes	Rating	Votes			
				A	B	C	D
Calypso	26	8.57	12	8	2	4	
Chengtu	20	8.45	6	8	5	1	
Chrome Orange	10	9.10	8	1		1	
Cinnabar	33	8.83	11	22			
Circe	12	8.58	6	2	3	1	
Cressida	29	8.77	14	12		3	
Crown of Gold	7	8.50	2	4		1	
Curlypate	10	7.90	1	5	1	3	
Dauntless	19	8.92	12	3	1	2	
Dawn	21	7.78	2	9	3	7	
Dazzler	9	8.61	3	5		1	
D. D. Wyman	28	8.35	13	11	1	3	
Dover	18	8.22	6	6	1	5	
E. A. Bowles	15	8.30	5	5	2	3	
Earliana	11	8.68	5	3	3		
Emily Hume	12	8.41	6	2	1	3	
Estmere	21	8.26	3	14		4	
Flamid	13	7.80	1	7		5	
H. Flava	27	88.61	9	15		3	
Flavina	8	8.62	5	1		2	
H. Flore pleno	13	8.19	1	9	1	2	
H. Fulva Europa	15	8.36	2	11		2	
H. Fulva Jap	3	8.50	2			1	
H. Fulva Chinese	4	9.22	3	1			
H. Fulva maculata	23	9.02	11	12			
H. Fulva Rosea	20	8.70	15	4	1		
Gaiety	10	9.30	9		1		
George Yeld	30	9.16	23	5	1	1	
Gloaming	8	8.62	5		2	1	
Gloriana	10	8.30	3	2	5		
Gold Dust	28	8.25	3	20		5	
Gold Imperial	16	8.81	9	5		2	
Golden Bell	15	8.50	3	10	1	1	
Golden Dream	24	8.95	15	7		2	
Golden Empress	7	7.78		3	3	1	
Golden West	14	9.42	13	1			
Goldeni	26	8.53	6	20			
H. Gracilis	19	7.81	2	8	3	6	
Gypsy, fulvous	18	7.38	4	7		7	
Highboy	13	8.11	3	5	2	3	
Hyperion	36	9.36	31	5			

Clone	Total	Votes	Rating	Votes			
				A	B	C	D
Imperator	23		8.71	9	12		2
Iris Perry	21		8.78	8	12		1
J. A. Crawford	29		8.64	13	13		3
James R. Mann	21		8.26	6	9	2	4
J. S. Gaynor	13		9.03	9	3		1
H. Kwanso	21		8.16	3	13		5
Kwanso var. fol.	13		8.34	3	7	1	2
Lady F. Hesketh	23		8.45	10	7	1	5
Lemona	26		8.26	11	7		8
Lemon King	19		7.86	2	10		7
Linda	19		8.81	11	4	3	1
Lovett's Lemon	10		8.30	2	6		2
Lovett's Orange	7		7.07		2		5
Marcus Perry	11		8.86	7	2	1	1
Margaret Perry	30		8.53	9	17		4
Mary Florence	15		8.43	6	4	3	2
Mary Stoker	10		8.40	3	5		2
May Sadlier	10		8.30	3	4	1	2
Midas	25		8.22	6	11	3	5
H. Middendorffii	17		7.85	2	8	1	6
Mikado	37		9.39	33	4		
H. Minor	16		8.37	5	7	1	3
Miranda	5		8.90	2	3		
Modesty	24		8.43	14	7		3
Mrs. A. H. Austin	26		8.52	14	10		2
Mrs. C. L. Leith	8		8.37	4		3	1
Mrs. J. R. Mann	11		7.77	2	4		5
Mrs. Perry	12		8.41	7	1		4
Mrs. W. H. Wyman	28		8.75	13	12		3
H. Multiflora	13		8.27	6	2	2	3
Nocerensis	10		7.90	2	4		4
Ophir	35		9.20	27	9		
Orangeman	16		7.87	2	8		6
Pale Moon	16		8.62	8	4	2	2
Parthenope	9		8.05	2	4		3
Patricia	26		9.34	23	2	1	
Pollyanna	7		8.07		3	2	2
Queen Mary	14		8.64	6	5	2	1
Queen of May	21		8.92	9	12		

Radiant	26	8.42	9	11	1	5
Rajah	21	9.21	16	4	1	
Royal	21	8.11	4	11		6
Semperflorens	7	8.50	3	2	1	1
Serenade	21	8.73	11	6	2	2
Shirley	13	8.57	7	3		3
H. Sieboldi	8	7.50		4		4
Sirius	17	8.61	9	4	1	3
Sir M. Foster	30	8.20	10	11		9
Sonny	19	8.97	12	5	1	1
Soudan	29	8.97	17	10	1	1
Sovereign	22	8.04	4	11		7
Stalwart	10	8.50	4	3	2	1
Star of Gold	9	8.38	4	2	1	2
Summer Multiflora Hybrids	17	7.91	5	2	5	5
Sungold	10	8.20	3	3	2	2
Sunkist	13	7.57		6	2	5
Sunny West	23	8.89	14	6	1	2
Tangerine	13	8.73	5	7		1
The Gem	24	8.29	3	16		5
Thelma Perry	10	7.40		3	3	4
Vesta	27	8.87	10	17		
Viscountess Byng	21	7.50	1	8	4	8
Vulcan	14	8.78	9	1	3	1
Wau-Bun	33	9.08	22	11		
Winsome	25	8.78	10	12	1	2
Wolof	16	8.81	10	2	3	1
Woodlot Gold	12	7.91	1	7		4
Yellow Hammer	7	8.35	1	5		1

TABLE 3. Evaluation of 124 daylily clones written in by voters, season 1939; Those marked (*) have already appeared on the discard list. Sponsorship as indicated in Table 1.

Clone	Votes				Clone	Votes			
	A	B	C	D		A	B	C	D
Afterglow			1		Baroni*	1		1	
Alba Straita				1	Beauty of Kent	1			
Aloma	1				Beloit		2		
Amber			1		Berenice	1			
Audrey Blaser	1				Betty	1			
Aurelia	1				Bold Courtiere	1			
Autumn Haze			1		Boutonniere	4		1	
					Brownie	1			

Clone	A	B	C	D	Clone	A	B	C	D
		Votes				Votes			
Carnival	1				John Greenleaf				
Charmaine	1				Whittier	1			
Cecil Houdyshel	1				Jubilee	1			
Ceres			1		Judge Orr	1			
Chisca			1		June Boissiere	1			
Chrysolora	1								
Cissie Guiseppe*	1			1	Kwanso Virginica	1	1		
Craemore Henna	1								
Craemore Ruby	1				Lady Londonderry			1	
Crepe				1	Lady Marie Stewart			1	
					La Tulipe	1			
Dainty	1				Large Gold	1			
Dorothy McDade	2				Lemon Queen		2		
Dr. Hughes	1				Luteola*				1
Dr. Regel*	2				Luteola major*		1		
Dr. Stout	1								
Duchess of Windsor	1				Mabel Hibberson			1	
					Majestic	2			
Elizabeth Pike			1		Mandarin*		1		
Enchantress	2				Mangol	1			
Erica	1	1			Marigold		1		
Estelle Friend	1				Mayor Starzynski	1			
					Mildred Crpet	1			
Fisher Variegated	1				Mona			1	
H. Flava major*				1	Moonbeam	1			
Florham*	2				Moonstone			1	2
Framingham			1		Mrs. John J. Tiggert	1			
Fred Howard	1				Mrs. Vieusseau	1			
Fulva Rosea Pastel	1				Mada	1			
Fulvola	2				Ochroleuca*	1	1		
					Omphale	1			
Giant Orange	1				Orange Vase	1		1	
Gladys Perry				1	Oriole				1
Glow			1						
Glowing		1			Pandora	1			
Golden Byng of Vimy	1				Peach Blow		1		1
Golden Fulva		1			Peony Red	1			
Golden Glow	1				Perry's Pigmy			1	
Gold Standard*				1	Persian Princess				1
H. Graminea			1	1	Petra	1			
					Pink Lass		1		
Hankow	2	1			Pink Lustre	1	1		
Hannah Dustin	1				Pride of Merrimac	1			
Harvest Moon*	1				Princess	2			
Helen Campbell			1		Princess Elizabeth	1			

Votes					Votes				
Clone	A	B	C	D	Clone	A	B	C	D
Ralph Schrieve	1				Summer Eve		1	1	
Rayon d'Or	1				Sunburst			1	
Reba Cooper	1				Sunset*			2	
Reggie Perry	1	1			Taplow Orange			1	
Rhodes	1				Taruga	2			
R. I. Lemon	1				Theron	1			
Robin Redbreast	2				H. Thunbergii*	1			2
Rose Queen			2		Victory Taierhchwang	1			
Russell Wolfe	1				Warren T. Hutchins	1			
Saturn	2				Wekiwa	1			
Sharon			1		Woodridge	1			
Shekinah	1	1			Winnie Nightingale	2	2	1	
Sir Chandra			1		Yellow Wonder			1	
Sir William	1								
Springtime			1						
Starlight			2						

TABLE 4. List of 17 best clones for 1939, and list of 24 clones to be discarded.

List of 17 clones scoring 9.00 or better

Mikado	(9.39)	Ophir	(9.20)	Apricot	(9.04)
Hyperion	(9.36)	Anna Betscher	(9.20)	Bijou	(9.05)
Patricia	(9.34)	Geo. Yeld	(9.16)	Chrome Orange	(9.10)
Bagdad	(9.21)	Wau-Bun	(9.08)	Gaiety	(9.30)
Rajah	(9.21)	Maculata	(9.02)	Golden West	(9.42)
				J. S. Gaynor	(9.03)
				Fulva Chinese	(9.22)

List of 24 clones receiving 5 or more discard votes

Bardeley	Midas
Dawn	Mrs. J. R. Mann
Dover	Orangeman
Flamid	Radiant
Gold Dust	Royal
H. Gracilis	Sir M. Foster
Gypsy	Sovereign
H. Kwanso	Summer Multiflora Hybrids
Lady F. Hesketh	Sunkist
Lemona	Viscountess Byng
Lemon King	The Gem
Lovett Orange	Middendorffii

DAYLILY MUSINGS AND 1940 EXPERIMENTAL DAYLILY POLL

ELMER A. CLAAR, *Illinois*

[Editorial Note.—The energetic Chairman of the Daylily Committee presents here some stimulating thoughts on the present status of the daylily, and these will be much appreciated by all members, especially the recommendation that daylily clones be evaluated by a competent group of judges, and that the work of the judges be checked by a symposium rating of the members on a regional basis. When one considers the present status of the daylily such recommendations are exceedingly valuable. His other suggestions are also worth considering seriously by all interested in the daylily.

Pending the appointment of the other members of the Committee, and the taking of a comprehensive official poll, the Chairman has undertaken an interesting experimental poll, following in some particulars, the earlier work of the late George DeWitt Kelso. He has grouped the clones into three classes, and those introduced more than three years ago are the subject of the experimental poll. The classification of the clones under color classes in Table 1, clones introduced from 1937 to 1940, is of course tentative, and the Chairman welcomes suggestions as to any desirable changes. Such a classification is very valuable and it is hoped that all will help to perfect this one, and also similar ones to be made in the future.

The Chairman of the Daylily Committee is to be highly commended for his accomplishments during his first year in office. —*Ed.*]

DAYLILY MUSINGS

Impressions that I have concerning the daylily situation at the present time are presented as follows.

Interest in daylilies has been growing by leaps and bounds, yet the daylily still means either a yellow or an orange flower to most people. More and more hybridizers are becoming interested in daylilies and it is hoped that the day is not far distant when pink, red, raspberry, rose, ivory, purple, bicolor and polychrome daylilies will be widely distributed. However, these newer hybrids are not widely distributed and even very few gardeners have ever seen some of the newer colors in daylilies.

Daylilies are slow propagators and it is well to remember that they have not been propagated very long; the oldest hybrid that I know, Apricot, was exhibited for the first time in London in June, 1892 by the late George Yeld. Inasmuch as I was born about this time, I refuse to consider this flower very old. George Yeld appears to have been the only one interested in hybridizing daylilies until Willy Mueller became active in the early 1900's. Dr. Stout has been interested in daylilies for many years but Mikado was described in House & Garden for the first time in June, 1929 and Cinnabar was offered to the trade by the Farr Nursery in 1930, so there can't be so very many of these plants in existence. Carl Betcher has been interested in daylilies all his life but

many of his introductions were offered about 1929; for example, *J. A. Crawford*—1929; *Bay State*—1929.

Recently I have talked about daylilies before a number of garden clubs and shown my color slides and movies. I have been impressed by the fact, for example at the meeting of the American Gardeners' Association which has a membership of about one hundred and fifty professional gardeners in and around Chicago, that very few of these folks had seen many of the newer hybrid daylilies.

I think one of the problems of our Society is to get a wider distribution of good daylilies. Plants may be grown from seeds, by proliferations, crown division and other variations of vegetative propagation. The quickest method would be by distributing seeds of daylilies. It is hoped that it will be possible to fix a general type in color, size and shape so that they will reproduce with reasonable fidelity from seed. It has been done with delphiniums. Dr. Leonian marketed seeds of daylilies for several years and Col. Edward Steichen said that he did not doubt that a large percentage of these would come reasonably true to color description. I am growing a number of plants sent me by Dr. Leonian this year; I'll be able to tell you more about this later. The other methods of propagation are quite slow.

A more rapid distribution of rare colored daylilies might be had if the hybridizers could be persuaded to be less ruthless in the killing of their seedlings of rare color. Those interested in the introduction of daylilies at the present time, as Dr. Stout, Mrs. Nesmith or Dr. Traub, for example, will go through a field of thirty thousand seedlings and select the most vivid "raspberry" colored seedling, move this into the garden to propagate and destroy a hundred other "Raspberry" seedlings not quite so vivid in coloring or not quite so attractive in shape as the one they preserve. In some cases, the difference between a named variety and some of its sister seedlings is so trivial as to be really microscopic. The rest of the "raspberry" seedlings are destroyed even though any one of them would be a real treasure in the garden of more than ninety-nine percent of the garden lovers of America.

Daylilies in the rarer colorings should be grouped in general groups and sold by classes. Reserve fewer and finer individual plants for naming but don't destroy thousands of rare, beautiful plants. If it is proper to sell seeds, it certainly is proper, sensible and I think it could be made good business to sell good seedlings even if each individual plant is not the best in the world.

Another problem the Society should deal with is the excessive number of named clones especially the yellow and orange clones. There is need for a critical study and evaluation of daylilies.

In any plan of evaluation one must first ascertain the specific use that those interested will make of the flower. A flower may satisfy one purpose perfectly and be entirely out of place in another.

If we are interested in a plant for our perennial garden we will look for different qualities that if one is interested in the plants for cut flowers, i.e. a florist's interest, or for hybridizing or for naturalizing.

If the last named one would need a large number, and the price would be most important. Daylilies are also used as a food and this plant is interesting to some people from the point of view of being a "golden vegetable." One wonders if the reds and purples are good food?

If we want a plant for our garden we may be interested in a plant for the rock garden which would be a dwarf or we may be interested in a plant for our perennial beds. If in the front of a perennial bed we again would want a dwarf, a medium plant for the middle and a tall plant for the rear.

If we want a plant for our perennial beds we must also decide the time we wish the plant to bloom, whether it should be an early bloomer, an intermediate, a summer or fall bloomer. We must decide which color we want, and last and very important, what price we will pay for the plant. A price classification might readily group plants that are \$1.00 or less and the recent introductions or novelties could be in two classes, one from \$1.00 to \$3.00 and the others from \$3.00 up. All this classification is a distinct bore to us but we don't see how it can be avoided.

If one is going to compare plants fairly they must be grown under similar conditions. We find that a clone may behave differently in Florida and Illinois, for instance. Further there are very few private growers and institutions that have a large collection of daylilies. Still a smaller number grow them under similar conditions. For example, in my own yard I have in 1940 over 275 named daylily clones. Some of the plants are in the shade and some are in the sun, some are facing south, some north, some east, some west, some are four years old and some are one year old. Some bloomed this year, some did not. These plants are certainly not growing under similar conditions. Therefore, the Daylily Committee has decided to divide the country into a number of climatic regions and we plan ultimately to have trial gardens in each of these regions so a truly comparative study of plants grown under similar conditions can be made.

Before we can evaluate daylilies we must adopt a definite plan or yard stick of evaluation. Our Society has adopted the plan used by the American Peony and American Iris Societies.

Some of the practical problems in evaluating daylilies are: (1) Catalogue descriptions are too often wrong. They are often copies of the descriptions by the introducer of the plant. A good example is Mr. Amos Perry's description of *Viscountess Byng* which he describes as a flower of delicate silver gray overlaid with rosy orange. I purchased the flower directly from Mr. Perry and it certainly does not come close to this description. Descriptions of the color of the plant should be carefully checked and when anyone finds a variation it should be reported to the Society so that we can print the truth. (2) Plants are too often mixed. I purchased *Aureole* which is described as an intermediate that blooms in June from one dealer and it bloomed for me in August. Many of the polls returned voted on plants which had this written after it—"The true variety." (3) A plant has often been introduced by one name and the same plant later sold under another name. In other words the same plant has two names. The Society should check this also.

Relative to the daylily poll I believe that it is also true that a symposium, while helpful, results in a considerable number of votes by individuals who have not had an opportunity to see many of the better daylilies. We will get better results when we have selected a group of well informed judges. Then let the symposiums check up on the judges' ratings; this is the proper sphere for symposiums. There is a tremendous possibility for improvement in many of the classes of daylilies. Dr. Stout has suggested some of the aims that he has in respect to these plants in his book on "Daylilies."

Other problems of the Society are as follows: Catalogues in the Northern part of the United States could be more helpful to their clients if they classified the plants offered as to time of bloom, i.e. the early, intermediate, summer and fall bloomers, and then further classify the plants by placing them in each of the broad color classes. This practice would so emphasize the large number of yellow and orange varieties that they would soon be very cheap unless they are very superior.

Dealers' catalogues do not offer a standard size daylily—for example, peonies are usually sold as a standard plant from 3 to 5 eyed. If a one or two-eyed plant is offered it is plainly labeled and is much cheaper. In the expensive daylily hybrids one usually gets a one-eyed plant. I believe that it would be better to say whether one is offering a 1, 3 or 5 eyed plant, making a difference in price for the different sized plants when they are available and giving the purchaser a right to choose what he wants.

Another matter that should be considered is that if a hybridizer or introducer of a flower believes that he has made a mistake in introducing a plant and thereafter refuses to continue to offer it for sale, I believe that other growers should also withdraw it from the market. For example, Farr & Company have withdrawn from the market all of the hybrids of the late B. H. Farr except the lovely Ophir because they believe they are inferior to other present day hybrids. Dr. A. B. Stout says that Browie was introduced by accident and he objects to the sale of this plant. However, it is catalogued by a number of firms and our members should be advised.

Our Society would be interested in having some of our hybridizers tell us more about their crosses. I have noticed for example that Dr. Stout uses *H. aurantiaca* in many of his crosses. Further we should like to see a study of sterilities and a study of diseases and their cure if a daylily has any diseases.

Too often an iris, peony or daylily which has been superseded and out-classed will be described in some catalogues with a very high-rating. Dealers using our ratings should append the year that the rating is made and if there is a subsequent higher or lower rating this should be used.

Again I wish to repeat that I am looking forward with boundless enthusiasm to the not far distant future when I can be growing some of the lovely things that I have seen this year in the trial gardens of breeders, namely, some of the pink, red, raspberry rose and purple daylilies and no doubt someone will sometime produce a white or near white daylily. Wouldn't that be lovely?

Table I. Tentative classification into color classes of clones introduced in 1937, 1938, 1939 and 1940.

Abbreviations:—The following abbreviations for daylily breeders are used in this table:

B.=Betscher, C. Dover, O.
C.=Cook, Paul, Little Silver, N. J.
D.=Dennett, C. N., Amesbury, Mass.
Dr.=Dreer, Henry H., Riverton, N. J.
G&C=Gray & Cole, Ward Hill, Mass.
H.=Hayward, Wyndham, Winter Park, Fla.
L.=Lovett Nursery, Little Silver, N. J.
L&L=Lord, R. P. & E. L., Orlando, Fla.

N.=Nesmith, Mrs. E. N., Lowell, Mass.
P.=Perry, Amos, Enfield, Eng.
Pl.=Plouf, L. Ernest, Lawrence, Mass.
PRG=Port Rose Gardens, Freeport, Ill.
R.=Russell, H. M., Houston, Texas.
S.=Sass, H. P., Elkhorn, Nebr.
Sc.=Schriener, Robert, St. Paul, Minn.

Sh.=Shull, J. Marion, Chevy Chase, Md.
St.=Stout, Dr. A. B., N. Y. Bot. Gard., New York City.
Tr.=Traub, Hamilton, P., Beltsville, Md.
UF=Univ. of Florida, Gainesville, Fla.
W.=Wallace, R. & Co., Tunbridge Wells, Eng.
Wh.=Wheeler, R. W., Winter Park, Fla.

Blooming season and color classes	1937	1938	1939	1940
EARLY: May to June 10 Selfs & Chromatic Selfs, Yellow: Orange: Red:				
INTERMEDIATE: June 11 to June 21 Selfs & Chromatic selfs, Yellow: Orange:				Judge Orr (Sc.) Victory Montevideo (Tr.)
SUMMER: June 22 to July 31 Selfs & Chromatic selfs, Yellow:				Theodore Mead (Tr.)
Orange:	Aztec Gold (D.) Beauty of Kent (W.) Circe (St.)	Columbia (L&L) Frank Russell (R.) Gaiety (B.) Golden Fleece (N.) Golden Glow (Tr.) Harvey Russell (R.) Jenny Lee (R.) Miss Annis (R.) Moon Glow (L&L) Spartan (R.) Miller's Daughter (R.) Tury (L&L) C-28 (R.)	Autumn Haze (N.) Buttercup (N.) Gem (N.) Golden Sceptre (N.) Her Highness (PRG) High Boy (G&C) John Blazer (Tr.) Lady Londonderry (P.) Lovett's Yellow (L.) Mildred (PRG) Nankin (N.) Nebraska (S.) Olive (PRG) Audrey Blazer (Tr.) Golden Fulva (B.) Harvest Moon (B.) Milwaukee Orange (PRG) Sally (H.) Stella (PRG) Sungold (Dr.)	Arctic Star (N.) Beacon (B.) Doe Skin (N.) Gay Lady (N.) Miss Priscilla (N.) Moon Bean (S.) Satsuma (N.) Shangri (Wh.) Yellow Tulip (Wh.) Anitra (Sh.) Musette (Sh.) Glowing Gold (N.) Golden Goblet (N.) Gipsy Flame (N.) Java (N.) Page Boy (N.) Summer Gold (N.) George Kelso (Tr.) Queen Wilhelmina (Tr.) Gipsy Laßs (Sh.) Gorgio (Sh.)
	Aloma (H.) Fulva Speciosa (W.)	Charlotte Traub (Tr.) Golden Byng of Vimy (P.) Golden Dawn (N.) Howard Russell (R.) Kublai Khan (L&L) U-29 (R.)		Craemore Henna (Pl.)
Selfs & Chromatic selfs, Red:			Cecil Houdyshel (Tr.) Emperor Jones (H.) Lenore (H.)	

1940 EXPERIMENTAL DAYLILY POLL

In the 1939 Kelso poll 40 people voted. I sent my questionnaires this year to these 40 people and an additional 27 making a total of 67 people. I was disappointed in not receiving the votes from some of the people who are best informed about daylilies. These lists should have been sent out earlier but I was unable to organize them any earlier and for this I wish to assume the complete responsibility. I feel that such experimental polls are helpful to daylily enthusiasts and the general public.

In conducting this poll I am first impressed with the fact that a daylily does not give a normal performance until it has grown in one spot for three years. Obviously any plant not in commerce over three years will not be widely distributed and will not be typical. Therefore my first classification has to do with the time the plant was introduced in commerce. This point of view gives us three classes. (1) The first group of plants are those that have not been introduced into commerce. Plants still in the trial gardens of our hybridizers or daylily specialists. It will be interesting from time to time to have description of these new plants in *Herbertia* by those who have seen them but obviously any vote on this type of plant would not be representative.

(2) The second group of plants are plants introduced in commerce within the last three years—1937, 1938, 1939 and 1940. Any plant less than three years old should be considered as on trial and not rated or compared with established plants in our poll. Therefore I have also excluded this group of plants from the 1940 poll. Plants introduced in commerce in each year should be listed and classified and opinions on these should be set out in *Herbertia* by those who have seen them. In future polls it would be interesting to compare plants in each classification introduced three years previously. See Table 1, for a partial tentative list of plants introduced in the years 1937, 1938, 1939 and 1940.

(3) The Third group of plants are plants that have been introduced in commerce for over three years, i.e. catalogued by a commercial firm during the year 1936 or earlier. These are the only plants in my opinion worth taking a poll by the members of the Society.

I believe a classification in the North based on the date of the first bloom would be helpful. This classification was divided into four classes dependent upon the date of the first bloom.

The next classification has to do with the color of the flower. We have treated our color classification in the most general way because this is one of the most difficult subjects relating to flowers. The color of a flower is not an inheritant quality but is largely dependent upon the quality of light reflected from its petals. The flower petals are stained with nature's finest vegetable dyes, distributed upon surfaces of limitless variation—smooth, rough, translucent, opaque, grained, crystalline, silken, velvety, mealy, metallic, and so on through an unending range of textures and thicknesses—their shades and intensities being modified by infinite interrelation. In many instances no two petals are the same in

hue or alike on both sides, or of uniform color even on one side. Colors in the same flower vary, not only from one bloom to another, but also from morning to afternoon or the next day, from sun to shade, from varying exposures, from effects of moisture or heat or from succeeding maturities. A device used by many organizations is to print a color with paint or ink on a paper and you compare this paper with the flower to describe its color. This method has very definite limitations. It is hazardous to guess how many hues, tints, tones and shades may be actually dyed. Gladys Miller in her book, "Decoratively Speaking", says, "One record stated there were 40,000 hues from which 100,000,000 colors could be made." Therefore these color charts only have a relatively few colors.

Another difficulty with this method is that the charts show reflected light only, whereas the tints and shades in flowers have translucent petals which glow and shimmer with color by both transmitted and reflected light. Comparing living flowers with dead pigment is therefore only an approximation, an average. We confess that we find it most difficult to visualize the flowers from the color descriptions used in most of our catalogues although they may be based on one or other of the color charts,—Massachusetts Horticultural Society, Royal Horticulture Society, Ridgway's, Hayden's, or *A Dictionary of Color* by A. Maerz and M. R. Paul.

Another fact which makes for confusion is that these color charts use similar descriptive terms for different colors and this is very confusing. For example the Royal Horticultural Society Colour Chart, Vol. 1, designates Sulphur Yellow as No. 1 and Ridgway's corresponding color is Lemon Yellow No. 23. The R. H. S. designates Lemon Yellow as No. 4, and Ridgway shows no corresponding color. R. H. S. calls Chinese Yellow No. 606, Ridgway calls it Apricot Yellow No. 19b. R. H. S. speaks of Apricot as 609, and Ridgway's description of this is a Capucine Yellow. Scarlet in R. H. S. is 19; in Ridgway's the corresponding color is Scarlet-Red No. 3, whereas Scarlet No. 16 in Ridgway's corresponds to Poppy Red No. 16 in R. H. S. Confusion is inevitable in a situation like this. We should either adopt one of these color charts and everyone should use it or use no color chart at all. If this cannot be brought about it would also be helpful if one would indicate what chart they are using. It is our opinion that the color of daylilies should be described in the simplest possible manner and that we will in time be able to select representative superior plants in each of the color classes.

We believe it would be useful to classify our daylilies according to this broad color classification. (a) Monochromes—Selfs and Chromatic Selfs (ignoring the color of the throat of the flower). Under the monochromes we would have, cream, yellow, orange, red, brown, purple, pink and rose. (b) Bi-colors: Under the Bi-colors we would have two subdivisions. 1—Petal one color—sepal another color. 2—Segments one color—spot another color. (c) Polychromes, Shots and Blends: We have not attempted to organize the Polychromes, shots, and blends this year.

These lists omitted some colors and I asked the recipient to add any flowers in the class where they belonged.

My lists after additions and corrections are as follows.

Table 2. Classification of Daylily clones introduced in 1936 or earlier on basis of blooming seasons; further subdivided by color classes.

EARLY BLOOMERS May to June 10th

<i>Apricot</i>	<i>Flava</i>	<i>Minor</i>
<i>Burbank</i>	<i>Flavina</i>	<i>Olif</i>
<i>Dumortieri</i>	<i>Gracilis</i>	<i>Orangeman</i>
<i>Earliana</i>	<i>Graminea</i>	<i>Sovereign</i>
<i>Estmere</i>	<i>Gold Dust</i>	<i>Tangerine</i>
<i>Flamid</i>	<i>Middendorffii</i>	

INTERMEDIATE BLOOMERS June 10 to June 21

<i>Ajax</i>	<i>Dr. Regal</i>	<i>Modesty</i>
<i>Aureole</i>	<i>Flava Major</i>	<i>Queen Mary</i>
<i>Ceres</i>	<i>Florham</i>	<i>Queen of May</i>
<i>Crown of Gold</i>	<i>Gloriana</i>	<i>Wau-Bun</i>
<i>Dover</i>	<i>Golden Dawn</i>	<i>Winsome</i>

SUMMER BLOOMERS

YELLOWS:

Light and Green Yellow:

<i>Baroni</i>	<i>Lemon Queen</i>	<i>Norceriensis</i>
<i>Calypso</i>	<i>Lemona</i>	<i>Pale Moon</i>
<i>Canary</i>	<i>Lovetts Lemon</i>	<i>Parthenope</i>
<i>Chrysantha</i>	<i>Luteola</i>	<i>Patricia</i>
<i>Citronella</i>	<i>Luteola Grandiflora</i>	<i>Plicata</i>
<i>Curlypate</i>	<i>Luteola Major</i>	<i>R. I. Lemon</i>
<i>Dorothy McDade</i>	<i>Luteola Pallens</i>	<i>Reginald Perry</i>
<i>Gay Day</i>	<i>Luteola Pallida</i>	<i>Sonny</i>
<i>Globe D'Or</i>	<i>Mary Florence</i>	<i>Soudan</i>
<i>Golconda</i>	<i>Mona</i>	<i>Starlight</i>
<i>Gold Standard</i>	<i>Mrs. Crawford</i>	<i>Star of Gold</i>
<i>Hyperion</i>	<i>Mrs. W. H. Wyman</i>	<i>Sunny West</i>
<i>Lady Hesketh</i>	<i>Multiflora Isis</i>	<i>Thelma Perry</i>
<i>Large Gold</i>	<i>Multiflora Luna</i>	<i>Thunbergii</i>
<i>Lemon King</i>	<i>Nana</i>	

Yellow:

<i>Anna Betcher</i>	<i>Golden Bell</i>	<i>Mulleri</i>
<i>Amaryllis</i>	<i>Golden Empress</i>	<i>Rayon d'Or</i>
<i>Eldorado</i>	<i>Gold Imperial</i>	<i>Royal</i>
<i>Garden Gold</i>	<i>Mercia</i>	<i>Woodlot Gold</i>
<i>Glow</i>	<i>Mrs. Perry</i>	<i>Yellow Hammer</i>

Orange Yellow :

Alba Striata
Bay State
Chrysolora
Emily Hume

Golden West
Helen Campbell
J. A. Crawford
Mrs. C. L. Seith

Ophir
Shirley
The Gem

*ORANGE :**Yellow Orange :*

Chrome Orange
Giant Orange
Golden Sceptre
Orange Glow

Orange Vase
Oriole
Pandora
Pyrrha

Radiant
Semperflorens
Summer Eve
Taplow Orange

Orange :

Aurantiaca
Aurantiaca Major
Beloit
Cressida
Erika
Framingham

Golden Dream
Marigold
Mars
Midas
Mrs. A. H. Austin
Multiflora Hybrids

Sirius
Spring Time
Todmorden
Vesta
Winnie Nightingale

Red Orange :

Forrestii
Gypsy

Imperator

Margaret Perry

*REDS :**Orange Red :*

Cissie Guiseppi

ROSE :

Fulva Rosea (Rosalind)

POLYCHROME & SHOTS & BLENDS :

Bagdad
Bardeley
Berenice
Bijou
Cinnabar
Chengtu
D. D. Wyman
Dauntless
Dawn
E. A. Bowles
Elizabeth Pyke
Enchantress
Europa

Fulva Maculata
George Yeld
Gladys Perry
Gloaming
Iris Perry
J. S. Gaynor
June Boissier
Kwanso Plena
Kwanso Plena
fl. var.
Kwanso Virginia
Marcus
Mary Grace

Mary Stoker
May Sadler
Mrs. Vieusseux
Peach Blow
Rhodes
Serenade
Shekinah
Sir William
Stalwart
Sunkist
Sylphide
Viscountess Byng

BI-COLORS

- (a) Petal one color Sepal another color.

None

- (b) Flower one color Spot on Throat another color.

Mikado, Rajah

Another classification which we believe to be helpful is the height of the scape. We did not use it this year. We would suggest that plants be grouped into the following divisions:

- | | |
|----------------------------|-------------------|
| (a) Dwarf and Semi-dwarf | — Under 2½ feet |
| (b) Semi-robust and robust | — 2½ Ft. to 5 ft. |
| (c) Giant | — over 5 ft. |

The plants would be classified according to price but there was not sufficient time to do this either.

We took a poll from three different points of view.

- (1) The ten best daylilies in commerce over three years,—Table 3.

THE TEN BEST DAYLILIES

There were twenty-three lists returned but only 20 people voted on the Ten Best Daylilies in 1940. It is interesting to note that 85 plants were listed by these 20 people. The last five plants were on three lists so that the Ten Best Daylilies in 1940 becomes Thirteen.

Table 3. The Ten Best Daylilies for 1940.

Mikado was on 17 of the 20 lists

Ophir was on 16 of the 20 lists

Hyperion was on 10 of the 20 lists

Wau-bun was on 9 of the 20 lists

Patricia was on 8 lists

Rajah was on 7 lists

Dauntless was on 6 lists

Sunny West was on 5 lists

Soudan, Fulva Rosalind, Golden Dream, Golden West and *Sonny* were on 4 of the 20 lists.

It is interesting to note that there are no Early Bloomers, One Intermediate, *Wau-bun*, and all the rest are Summer Bloomers. Eight of the Summer Bloomers are yellow, (4 light yellow, 3 medium yellow and 1 orange yellow) one orange, two are bi-colors, with the segment one color and a spot of another color and one is a polychrome.

Inasmuch as we threw out a number of votes of plants that were not in commerce for three years we will list below those plants receiving 3 votes,—*Anna Betscher, Bagdad, Bijou, Cressida, Mrs. A. H. Austin, Maculata*, and *Serenade*.

(2) A rating of the Daylilies in commerce over three years using the numerical system, that is, “A” is 95, “B” is 85, “C” is 75 and “D” is discard. This is the same plan used by the late Prof. Kelso, but we have limited it to plants in commerce over three years and we only listed those that received ten votes or more in the yellow and orange classes. We took the average score by adding all the votes on a variety and divided this number by the number of votes received by the flower,—Table 4.

Table 4. Rating of Daylily clones in commerce over three years on a numerical basis; further subdivided by colors.

YELLOW

Light and Green Yellow

		No. of Votes	“A”	“B”	“C”
<i>Patricia</i>	95.00	9	9		
<i>Hyperion</i>	94.09	11	10	1	—
<i>Sunny West</i>	85.00	9	2	5	2
<i>Sonny</i>	86.25	8	3	3	2
<i>J. A. Crawford</i>	85.00	8	2	4	2
<i>Calypso</i>	83.88	9	2	4	3
<i>Flava</i>	81.66	9		6	3

Yellow

<i>Anna Betscher</i>	89.44	9	5	3	1
<i>Golden Bell</i>	89.00	5	2	3	—
<i>Gold Imperial</i>	87.00	5	1	4	—

Orange Yellow

<i>Ophir</i>	93.14	8	7	1	—
<i>Bay State</i>	83.35	8	1	5	2
<i>The Gem</i>	82.50	8	1	4	3

ORANGE

Yellow Orange

<i>Radiant</i>	89.00	5	2	3	—
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Orange

<i>Golden Dream</i>	92.14	7	5	2	—
<i>Cressida</i>	88.33	9	3	6	—
<i>Mrs. A. H. Austin</i>	87.85	7	3	3	1
<i>Goldeni</i>	81.25	8	1	3	4

Red Orange

<i>Imperator</i>	86.66	6	2	3	1
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ROSE

<i>Fulva Rosea (Rosalind)</i>	91.00	5	3	2	—
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POLYCHROME & SHOTS

		No. of Votes	“A”	“B”	“C”
<i>Chengtu</i>	92.14	7	5	2	—
<i>Bagdad</i>	90.55	9	6	2	1
<i>Serenade</i>	89.44	9	5	3	1
<i>Fluva Maculata</i>	87.50	8	3	4	1
<i>Bijou</i>	87.22	9	4	3	2
<i>George Yeld</i>	86.11	9	2	6	1

BI-COLORS

Petal one color sepal another color	—	—	—	—
-------------------------------------	---	---	---	---

Flower one color spot on throat another color.

<i>Rajah</i>	93.00	10	8	2	—
<i>Mikado</i>	91.36	11	8	2	1

(3) We also secured a vote on the 1st, 2nd and 3rd best in each blooming period and in each color class for plants in commerce over three years. We eliminated all plants that did not receive one first class vote. Table 5.

Table 5. The first, second, and third best in each blooming period; further subdivided by color classes.

EARLY BLOOMERS.—Returns were received from 7 people on the Early Blooming varieties and we were able to conclude from this that among the Green Yellows that *Flava* and *Flavina* were 1st and 2nd. Among the Oranges—*Tangerine* is desirable.

There is a very considerable discrepancy between the color classifications of *Earliana*, *Estmere*, *Gold Dust*, *Sovereign* and *Apricot*. We are therefore grouping them together until we have another season to study them.

INTERMEDIATE BLOOMERS.—Returns were received from 7 people again. In the Green Yellow, *Modesty* and *Flava Major* were favorites; while in the Yellows—*Winsome* was the favorite. Among the oranges, *Dover* and *Crown of Gold* were voted desirable.

There is such a general disagreement about color classification of *Sir Michael Foster*, *Queen of May* and *Queen Mary* that we are going to hold this group over for another year for further study.

It is interesting to note that almost everyone classified *Wau-Bun* as an Orange Yellow except the introducer, who classified it as a yellow. However, inasmuch as it has a bit of fulvous we put it in the Polychromes. Nearly everyone likes *Wau-Bun*.

SUMMER BLOOMERS.—

YELLOWS

(a) *Light and Green Yellow*

	<i>First</i>	<i>Second</i>	<i>Third</i>
<i>Patricia</i>	8	2	3
<i>Hyperion</i>	6	6	2
<i>Sunny West</i>	1	2	1
<i>Sonny</i>	1	2	2
<i>Starlight</i>	1	—	—
<i>Thunbergii</i>	1	—	—
<i>Star of Gold</i>	1	—	—
<i>Soudan</i>	1	—	—

(b) *Yellow*

<i>Anna Betcher</i>	4	3	1
<i>Golden Bell</i>	4	4	1
<i>Gold Imperial</i>	1	1	1
<i>Amaryllis</i>	1	—	2
<i>Royal</i>	1	—	—
<i>Woodlot Gold</i>	1	—	—

(c) *Orange Yellow*

<i>Ophir</i>	10	5	1
<i>Golden West</i>	5	3	1
<i>Sirius</i>	3		
<i>The Gem</i>	1	1	3
<i>Emily Hume</i>	1	1	2
<i>Bay State</i>	1	—	2

ORANGE

(a) *Yellow Orange*

<i>Radiant</i>	4	2	1
<i>Chrome Orange</i>	4	2	—
<i>Semperflorens</i>	1	1	2
<i>Aztec Gold</i>	1	—	1
<i>Golden Scepter</i>	1	—	—

(b) *Orange*

<i>Mrs. A. H. Austin</i>	3	2	—
<i>Multiflora Hybrids</i>	3	—	1
<i>Golden Dream</i>	2	4	1
<i>Cressida</i>	2	2	3
<i>Aurantica Major</i>	2	—	—
<i>Sungold</i>	1	—	—
<i>Vesta</i>	1	—	—

(c) *Red Orange*

	<i>First</i>	<i>Second</i>	<i>Third</i>
<i>Imperator</i>	5	3	1
<i>Gypsy</i>	2	1	—
<i>Forrestii Perry's Var.</i>	1	—	—
<i>Margaret Perry</i>	1	—	—

(d) *Orange Red*

<i>Cissie Guiseppi</i>	3	—	—
<i>Sir William</i>	2	—	—

RED

<i>Robin Red Breast</i>	1	—	—
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ROSE

<i>Fulva Rosalind</i>	6	3	—
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POLYCHROME AND SHOTS

<i>Chengtu</i>	3	1	—
<i>Bagdad</i>	2	1	4
<i>Dauntless</i>	2	2	1
<i>Serenade</i>	1	4	—
<i>George Yeld</i>	1	—	2
<i>Fulva Maculata</i>	1	—	3
<i>Bijou</i>	1	1	—
<i>Sunkist</i>	1	—	—
<i>Viscountess Byng</i>	1	—	—
<i>E. A. Bowles</i>	1	2	1
<i>Europa</i>	2	2	—
<i>Kwanso Plena</i>	5	—	—

BI-COLORS

(a) Petal one color Sepal another color (Nothing in commerce over three years)

(b) Flower one color Spot on Throat another color.

<i>Mikado</i>	13	3	—
<i>Rajah</i>	4	10	1

REVISED PLAN, AND INSTRUCTIONS TO THE DAYLILY COMMITTEE OF THE AMERICAN AMARYLLIS SOCIETY*

The Special Daylily Committee was organized by vote of the Board of Directors for the purpose of evaluating daylily clones. The Committee is to consist of a Chairman, who is to make an annual report for the committee, and not less than four other members to be appointed by the Board. The objectives are to be achieved by means of trial gardens, and jury and symposium ratings of clones at intervals. On recommendation of the Chairman, Mr. Elmer A. Claar, the Board has authorized the appointment of a jury of not less than 20 competent jurors who are to evaluate daylily clones. Such ratings are to be official for the Society, but shall be revised from the standpoint of regional adaptation from time to time on the basis of symposia carried out on a regional basis in which all members of the Society who grow daylilies are to take part.

Trial gardens are to be established in cooperation with the state agricultural experiment stations, colleges and universities, in six or more climatic regions as follows: (1) Middle West (Midland); (2) Northeast; (3) Southeast—all of traditional South, except Florida; (4) Florida (humid subtropics); (5) Southwest; (6) Northwest, (7) other regions—Hawaii, Canada, etc. Details of cooperation are to be worked out by the committee and submitted to the board for approval.

As a basic attack on the problem of discarding inferior clones, jury and symposium ratings are to be carried out for all clones in commerce at intervals as already indicated. Rating is to be on a numerical basis, from 1 to 10, and finally to one decimal point (6.5, 9.7, 7.7 etc.). Clones rating 7.5 or below are to be omitted from the next symposium list, but may be restored for valid reasons. Clones are to appear on one of two lists, (a) those in commerce for more than three years, and (b) those in commerce for less than three years. After each clone has been given a numerical rating by the jury, those rating 7.6 or above are to be arranged according to blooming seasons and submitted to the vote of the daylily growers in the regions. The further arrangement of clones, after numerical ratings have been given, under such categories as (a) color classes, (b) height of plant, (c) drought resistance, (d) decorative value of foliage, particularly in the South, (e) shade tolerance, etc., is to be undertaken as research projects by individual members of the Committee.

In order to put the description of daylily clones on a comparable basis everywhere, the Society has adopted the excellent text for data card (Plate 179) submitted by J. Marion Shull. This text is at present printed on 3"x5" cards. This data card is to be used in describing both new clones and those already introduced.

The following score card for rating daylily clones, and scheme for conducting symposia are to be followed subject to future revisions:

* Summary of official action by Board of Trustees. —Ed.

Score Card for Rating Daylily Clones

[This score card is subject to future revision and is to be considered as a starting point.]

<i>Character to be scored:</i>	<i>Method of rating:</i>	<i>Possible score:</i>
<i>Vigor</i>	Plant must be able to stand up under climatic conditions under which it is grown; if plant is weak, deduct at least $\frac{3}{4}$ of possible score.	10
<i>Foliage</i>	Foliage should be considered from standpoint of its garden decorative value, but deciduous habit should not be penalized in North.	5
<i>Scape, and number of flowers to scape</i>	The flower scape should be considered from standpoint of sturdiness; should not be too sturdy nor too weak; however, such a scape as that of Wau-Bun should be considered as perfect for its type. Consider cleanliness; deduct $\frac{1}{2}$ of possible score if lacking in this particular.	15
<i>Flower shape or form</i>	Many shapes will be recognized so long as they are beautiful.	15
<i>Flower size</i>	All sizes of flowers will be recognized so long as they are well proportioned with reference to the scape—a small flower on a stout scape, for instance, is quite objectionable, and should be penalized a full 8 points.	8
<i>Flower color and texture</i>	The main emphasis should be put on purity of color rather than on mere novelty.	35*
<i>Flower odor</i>	If odor is absent or unpleasant deduct points accordingly; if present and pleasant count the full 2 points.	2
<i>Flower durability</i>	If flower fades in morning in full sunshine, deduct 7 points; if it fades in the afternoon, deduct 3 points. Flowers that do not fade or improve in full sunshine are to receive the full 10 points.	10
Total		100

* This has been weighted so that no clone of inferior flower color will pass.

Forms for Daylily Symposium of the
American Amaryllis Society

Cooperator's name : Address..... Date.....
Region : *Midland.....; Northeast.....; Southeast.....; Fla. (Subtrop.).....;*
Northwest.....; Southwest.....; Eastern Canada.....;
Western Canada.....; Other (fill in)..... .

Note.—Check the region in which you live, or fill in name if your Region is not listed.

Instructions. Please read rating instructions carefully and then rate each species or clone (commonly called “variety”) with which you are familiar as a grower, and return this form by October 1, 19....., to Mr. Elmer A. Claar, 1301 Chestnut St., Wilmette, Ill. The complete results will be published in *Herbertia*.

All daylily growers are requested to cooperate in this symposium rating only the species and clones with which they are familiar.

Ratings. All species and clones listed below, and also others not listed that should be included, and which you are requested to write in, are to be given a numerical rating, using numbers from 1 to 10 for whole numbers, and decimals for values between whole numbers,—3.4; 6.5; 9.7; 6.8; 8.3, etc., etc., depending on the merits of each species or clone. The following values are to be associated with the numbers:

<i>Excellent</i>	9.0 and above
<i>Good</i>	8.0 to 8.9
<i>Fair</i>	7.6 to 7.9
<i>Poor</i>	7.5 and below

In making ratings use should be made of the scale of points for daylilies as set forth in the official score card.

All clones rating lower than 7.6 should be considered as discards for purposes of this symposium, and on this basis clones rating lower than 7.6 in previous symposia are not to be listed any longer for rating. If for any reason any of these clones are adapted to some regions, they should be written in and re-rated. Ratings are to be written in the spaces at the left of the species, varieties and clones.

I. SPECIES AND BOTANICAL VARIETIES

Note. Species and their varieties have been evolved in nature and are therefore not subject to rating on the ordinary basis since they are biological entities recognized in the science of botany. However, they can be rated here as to their garden value and cut-flower adaptibility.

Rating	Species	Rating	Species
1.	<i>Hemerocallis multiflora</i> Stout	7.	<i>Hemerocallis aurantiaca</i> Baker, <i>aurantiaca</i> var. major Baker
2.	<i>Hemerocallis flava</i> Linn.	8.	<i>Hemerocallis exaltata</i> Stout
3.	<i>Hemerocallis minor</i> Miller	9.	<i>Hemerocallis Forrestii</i> Diels
4.	<i>Hemerocallis serotina</i> Focke (syn. <i>H. Thunbergii</i>)	10.	<i>Hemerocallis plicata</i> Stapf
5.	<i>Hemerocallis citrina</i> Baroni	11.	<i>Hemerocallis nana</i> Forrest & Smith
6.	<i>Hemerocallis fulva</i> Linn., <i>fulva</i> var., <i>rosea</i> Stout	12.	<i>Hemerocallis Dumortierii</i> Morren
		13.	<i>Hemerocallis Middendorffii</i> Trautv. & Meyer

Write in and rate any other species or botanical varieties in the space below:

_____	_____	_____	_____
_____	_____	_____	_____

II. CLONES IN COMMERCE FOR MORE THAN THREE YEARS

Abbreviations for daylily breeders and climatic regions: (To be standardized by Daylily Committee).

Rating	Clone	Rating	Clone
_____	<i>Ajax</i> (W. M., 1908)	_____	<i>Goldeni</i> (B., 1929)
_____	<i>Apricot</i> (Y., 1892)	_____	<i>Gypsy</i> (B., 1929)
_____	<i>Bijou</i> (St., 19.....)	_____	<i>Hyperion</i> (M., 1925)
_____	<i>Cressida</i> (B., 1929)	_____	<i>Mikado</i> (St., 1929)
_____	<i>Estmere</i> (Y., 1906)	_____	<i>Modesty</i> (B., 1929)
_____	<i>Gold Dust</i> (Y., 1906)	_____	<i>Ophir</i> (F., 1924)
	Etc., Etc., Etc.		

III. CLONES IN COMMERCE LESS THAN THREE YEARS

Arrange as in II. above.

REGISTRATION OF NEW CLONES

Descriptions of new clones of hybrid amaryllids and alstroemerids for this section should reach the editor by June 1 if possible. Information sent after that date may be held over to the next issue if space is not available. This information is published to avoid duplication of names, and to provide a place for the authentic recording of *brief* descriptions. Names should be as short as possible—one word is sufficient. It is suggested that in no case should more than two words be used.



Wyndham Hayward, Winter Park, Fla.

See page 131

Hybrid Amaryllis—Louise Hayward

HYBRID AMARYLLIS CLONES

Introduced by R. W. Wheeler, Winter Park, Fla.

BEACON (184) Leopoldi, Type A. Large flower, 8 inches, of very wide rounded petals and exceptionally fine form. The edges of the petals are frilled in the center of the flower. The color is a brilliant, deep red with violet tones, darker in the center and shading out lighter towards the edges, especially on the lower petals. First Prize in its Class; First Class Certificate; Best Flower in the Show. Southeastern Amaryllis Show of the American Amaryllis Society 1940.

KILLARNEY (1-42-1) Leopoldi, Type A. A medium size flower with wide, rounded petals and of good, compact form. Petal tips slightly recurved. The color is a very dark red, darker in the throat and satiny. No mottling or any other color than red. First Prize in its Class and First Class Certificate, Southeastern Amaryllis Show 1940.

LAKEMONT (1-46-6) Leopoldi, Type A. Medium to large flower, which opens with a fairly flat face and petal tips slightly recurved. The color is solid red, clean to the throat, which is dark. The texture is velvety. First Prize in its Class and First Class Certificate, Southeastern Amaryllis Show 1940.

LILLIAN YOST (139) Leopoldi, Type A. Very large flower, 8 to 9 inches. Very wide, rounded petals which open wide with a slightly curved face. The ground color is shell pink, with darker rose pink feathering especially on the two upper petals.

PINK PEARL (6-18-7) Reginae, Type A. Large flower, 8 inches, with wide, semi rounded petals which open well. This is a solid, true pink Amaryllis, the color being close to Debutante Pink, 1-G-7. There is a little deeper pink feathering in the center and some pale green deep in the throat.

PRIAM (156) Leopoldi, Type A. Very large flower, 8 to 9 inches, with very wide, rounded and cupped petals, forming a slightly convex face. The color is a vivid, light red, on the salmon, with no discoloration in the throat.

ROYAL GARNET (1-43-12) Leopoldi, Type A. This is a large flower, 7 $\frac{1}{4}$ inches, with wide, rounded petals. It opens with an exceptionally shallow trumpet. The color is a very dark red, darker in the throat, and an all over satiny appearance.

SUNRISE (1-39-6) Leopoldi, Type A. Medium size of good form with very recurved petals. The color is a soft light red with darker red feathering towards the center and a little frosted effect on the lower petals.

SUSAN HOUGH (6-49-11) Reginae, Type A. A large flower with very wide but pointed petals, the petal tips being very recurved and the trumpet shallow. The color is Old Rose, 4-I-2, shading to lighter on the outside and through the center of the petals, and to deeper towards the center of the flower. The deep throat is grass green. A very beautiful flower.

THORNKILL (169) Leopoldi, Type A. This is a medium size flower, but of the finest form. The wide, rounded petals open full and perfect with their outer edges rolled back, forming an almost perfect and unbroken circle. The color is a good, soft, medium dark red, clean to the center, which is darker. In addition to the form, the beauty is in the effect produced by narrow, darker bands extending lengthwise of the petals, not unlike a two toned corduroy.

Hybrid Amaryllis—Louise Hayward

Wyndham Hayward, *Florida*

The pure white hybrid amaryllis, *Louise Hayward*, illustrated in this number of *Herbertia* (Plate 180), is one of the most charming and perfect forms of the pure whites that the writer has seen in a dozen years of growing amaryllis in ordinary sandy loam beds. It bloomed in four years from seed (of the Ludwig Strain in Holland), and is snowy white except for a slight medium apple green shading at the base of the throat.

Hybrid Amaryllis—Mont Blanc

R. W. Kenny, Winnepeg, Canada

This clone was obtained in England three years ago. It bloomed the first year with one scape and four blooms. These were well shaped, medium in size but had a well marked green rib. The plant bloomed in February. Repotting was done when the bloom scape withered and it was kept in warmth and light without drying off.

The second year it bloomed in February with one scape and four blooms and did not vary from the first year. Again it was repotted and kept growing without drying off.

This season at the end of December the four large straps began to turn brown. The plant was set to one side out of direct light, and soon a large bloom scape appeared. This was very vigorous and was more robust than either of the preceding years. Only two blooms developed but they had wonderful texture and sheen and very little green mid rib. The illustration, Fig. 52, shows one flower.

HYBRID DAYLILY (HEMEROCALLIS) CLONES

Introduced by J. Marion Shull, 207 Raymond St., Chevy Chase, Md.

Anitra (Shull, A-4) Pale Lemon Yellow self, greenish at throat. Petals $1\frac{5}{8}$ X $4\frac{3}{4}$ inches, sepals $\frac{7}{8}$ X $4\frac{3}{4}$; spread 5 to 6 inches; heavy substance; fragrant. Scape 47 inches; late. Fine clump, mostly upright, deep green. Best in partial shade.

Gipsy Lass (Shull, C-3) Rich Orange self with faint reddish flashings, Old Gold deep in throat. Wide spreading full flower. Petals $1\frac{1}{2}$ X $3\frac{1}{2}$ inches, sepals 1 X $3\frac{1}{2}$. Spread $4\frac{1}{2}$ inches. All day bloomer, unaffected by sun. Robust, yellow-green, arching foliage. Scape 4 feet. Growth somewhat diffuse.

Gorgio (Shull, E-6) Brilliant Light Cadmium self with attractive nearly white midrib. Flower full, widely recurved, fine carriage. Petals $1\frac{1}{2}$ X 4 inches, sepals $\frac{7}{8}$ X 4. Spread 5 inches. Scape 3 feet. Robust, yellow-green, rather erect compact clump.

Musette (Shull, A-6) Empire Yellow self, greenish at throat. Very heavy substance. Petals $1\frac{5}{8}$ X $4\frac{3}{4}$ inches, sepals $\frac{7}{8}$ X $4\frac{3}{4}$. Spread 6



Fig. 52. Hybrid *Amaryllis*—*Mont Blanc*

to 8 inches. Fine blue-green, arching clump. Scape 43 inches. All day bloomer; stands sun well. Late.

Introduced by R. W. Wheeler, Winter Park, Fla.

Aristocrat (J-2) Semi Robust, very long and narrow sepals and petals of sufficient substance to hold a graceful form. The flower diameter is 9 inches. The chief color is Leghorn (T. C. C. A. No. S4115), with a green gold throat and cream lines through the center of the petals and a striking V shaped eye zone on the petals. The color of the eye zone is (M. & P. 3-G-12).

Bali (No. 48) Semi Robust, small cup shaped flower of fine form, multiflora habit, straight, strong stems, evergreen, continuous bloomer. The flower color is M. & P. Indian, 12-C-12, with a somewhat darker faint eye zone 10-G-12.

Cadmus (D 32-5) Semi Robust, large cup shaped flower with the tips of the sepals somewhat recurved and the petal tips recurved and sometimes twisted. Flower diameter 6 inches, petal width $1\frac{3}{4}$ inches, sepal width 1 inch. The throat and ground are deep yellow with a soft fulvous red on the petals and some of the same color dusted on the sepals. The faint eye zone is violet red, as also is the veining in the petals.

Reba Elgar (H 20-1) Robust in growth, a large, wide petaled flower of intermediate form. Flower diameter $5\frac{1}{2}$ inches, petals $1\frac{11}{16}$ inches, sepals 1 inch. The petals are beautifully creped and have ruffled edges. The throat and ground are deep gold. The petal color is light amber on this gold ground, gold lines through the center of the petals. The sepals are lightly dusted with the amber. The distinctive eye zone is darker and on the soft red.

Lady Franklin (C-76-5) Robust, large flower, compact, sepals and petals decidedly recurved. The dominant color is mauve rose with rose red veining and rather wide eye zone of this same rose red, which shades into the petal color and gold throat.

Hindoo Girl (J70-5) Semi Robust, medium large flower of compact form as to throat, sepals very recurved, petals wide, ruffled and creped, tips recurved and twisted. The color is a handsome, soft, fulvous red with a deeper red eye zone which is not too pronounced and a green gold throat. A flower of distinction both as to color and form.

Indian Squaw (J-7) Robust, very long but narrow sepals and petals. Flower diameter $8\frac{3}{4}$ inches, petals $1\frac{1}{4}$ inches, sepals $\frac{3}{4}$ inch. The main color is Burnt Orange, 3 E 12, on a deep orange ground. The darker eye zone, 3 G 12, is in the form of an acute angle V.

Herkimer Johnson (J-9) Semi Robust, very large flower, compact form as to throat, sepals recurved, petals wide, creped, tips recurved and twisted. Flower diameter $6\frac{1}{2}$ inches, petals $1\frac{5}{8}$ inches, sepals 1 inch. The ground color is a deep golden yellow overlaid with a faint but wide cinnamon eye zone which extends deep into the throat and well up on the sepals and petals.

Quaker Lady (M-12) Semi Dwarf, medium size flowers, intermediate form, petals wide for size of flower, creped and twisted tips. Light, greenish gold throat and ground with light brown dusting on sepals. The petals are a solid pastel brown mahogany. Many blooming stems and a recurrent bloomer.

Ruby Supreme (E-57-5) Robust, very large flower, intermediate form, multiflora habit, strong grower. Flower diameter $7\frac{1}{4}$ inches, petals $1\frac{3}{4}$ inches, sepals $1\frac{1}{16}$ inches. Main color Antique Ruby, 6-L-6. This is a little lighter on the sepals. The throat is greenish gold and there is a narrow gold line through the center of the petals.

Shangri (F-3-1) Semi Robust, large flower, wide sepals and petals which are roundly recurved and the petals are ruffled. Flower diameter $5\frac{1}{2}$ inches, petals $1\frac{5}{8}$ inches, sepals $1\frac{1}{8}$ inches. The color is a deep lemon yellow which stands full sun all day.

Shauri (G-70-4) Robust, very large flower, sepals and petals more recurved than Dauntless. Flower diameter $8\frac{1}{4}$ inches, petals $1\frac{1}{2}$ inches,

sepals 1 inch. The coloring is pastel, mauve rose with a little darker eye zone extending in points up into the petals. The throat is greenish gold and there are cream lines through the center of the petals.

Titania (D-10) Semi Dwarf, small flower which opens out flat, sepal tips some twisted, petal edges ruffled. The throat and ground color is greenish lemon. There is light brown dusting on the sepals and the petals are colored a pastel brown. Many blooming stems.

Caroline Vernon (E-30-4) Semi Robust, large flower with wide petals, cup shape throat, opens fairly flat face with sepal and petal tips recurved. The sepals and petals are entirely different in texture, the sepals being heavy and stiff while the petals are almost transparent, crepy and ruffled. The throat and sepals are bright orange, the petals mauve orange with soft red eye zone and dark orange veins.

Elizabeth Wheeler (B-2-5) Robust, medium size, cup shape flower. Throat and ground are gold yellow, the petals are rose red, while the sepals have more of the gold with rose red veins and lines.

Yellow Tulip (C-35-1) Semi Robust, large flower, opens like a tulip, faces up. The color is a deep canary yellow. Many stems, a recurrent bloomer from April into September.

Introduced by Hamilton P. Traub, Mira Flores, Orlando, Fla.

Helen Wheeler (No. 459); semi-dwarf; pastel pink (Etruscan), eye-zone slightly deeper; middle of May.

Rouge Vermilion (No. 466); semi-dwarf; Scarlet (Rouge Vermilion) RHS 19; sepals lighter; orange throat; late May.

Theodore Mead (No. 407); semi-dwarf; petals and sepals much twisted; flower about 7 inches across face, of excellent substance, Saffron Yellow (RHS 7/1), gold glistening; early April.

Fire Red (No. 524); semi-robust; Fire Red (RHS 15), sepals lighter; orange throat; early June.

Emberglow (No. 424); robust; pale yellow shot Emberglow (3-G-10), eye-zone slightly darker; yellow throat, sepals lighter Emberglow; multiflora flowering habit; middle of May.

George Kelso (No. 501); robust; flower large, 5½" across face; petals ruffled, 1½" wide, sepals 1" wide; bi-color, light orange suffused bronze; sepals lighter; early April. Named in honor of the late George DeWitt Kelso.

Queen Wilhelmina (No. 353); robust, Carmium Orange (RHS 8/1) with near white mid-rib; middle of May.

Victory Montevideo (No. 401); robust, near Chianti (6-L-6), throat golden yellow. This is the first introduction of an early red variety using Queen of May as one of the parents for the early flowering character. In central Florida it has flowered in early March while under trial. Named in commemoration of the British victory off Montevideo in 1939.

Victory Suomussalmi (No. 460); robust; orange self suffused rufous; multiflora flowering habit; middle of May. Named in commemoration of the brilliant victory of the Finns.

HYBRIDS NERINES

Hybrid Nerine—Chameleon

W. M. James, California

The hybrid, *Nerine, Chameleon*, is the result of a cross between *N. filifolia* (See page 135, Vol. 3, 1936 *Herbertia*) and *N. corusca major*



W. M. James, Santa Barbara, Calif.

Fig. 53. Hybrid Nerine—Chameleon

(See page 239, Vol. 4, 1937 *Herbertia*) made by the writer at Las Positas Nursery. Its foliage is evergreen, one-fourth to three-eighths inch wide, six to eight inches long and gray-green in color. Bulbs mul-

tiply much faster than do those of the paternal parent, *N. corusca major*, but not as fast as do those of the maternal parent, and sometimes produce more than one flower stem in a season.

The flower is attractive in appearance and comparatively large (Fig. 53). The petals are generally rose red in color, lightly edged with soft gray purple on the lower half and are covered throughout with a golden sheen. A small percentage of the flowers are rose red all over. Even though there is a slight variation in color when the flowers first open, as a rule they hold the first color for several days after being cut and taken into the house. A few slowly change to a light grayish purple as they age. Those which open indoors are usually less red, sometimes being a rosy lilac and sometimes a soft rose pink. The interesting and pleasing variation in color of this hybrid is what suggested the name, *Chameleon*.

The flowers are approximately two and one-half inches across, broadly funnel-shaped, and there are twelve to fifteen per umbel. The petals are three-sixteenths to one-fourth inch broad, about one and one-half inches long, gracefully recurved above the center and sometimes undulating. The stamens are usually as long as the petals.

The strong slender stems are twelve to fifteen inches long, some being erect and some slightly curved. If a stem is cut when the first bud is opening, the rest will open and last from seven to ten days.

Should propagation continue at the present rate, it will not be long before there are sufficient bulbs for distribution. So far hybrid Nerine, *Chameleon* gives promise of adding some desirable characteristics to a noteworthy group.

IMPROVED EUCHARIS

New Eucharis grandiflora clone—Julius Thomas

Karl J. Easton, Florida

A new and improved clone of the well known Amaryllid, *Eucharis grandiflora*, has been observed in recent years in the plant collection of a florist at Lake Worth, Florida, Mr. Julius J. Thomas of the Thomas Flower Conservatory.

Mr. Thomas, a local grower and plant authority, has some hundreds of the improved clone of *Eucharis* growing in his lath-house at Lake Worth, which is near the winter society resort of Palm Beach. The writer has studied these plants in bloom at Mr. Thomas' establishment during the season of 1938-39, and found them to be among the most beautiful displays of flowers he has ever seen. Because of the interest which the new *Eucharis* has aroused, the following statement was obtained from Mr. Thomas as to their origin and how they came into his possession.

"While a resident of New Jersey, I became acquainted with a Californian who told me of a beautiful *Eucharis grandiflora* sport he had noticed growing in his greenhouse. The Californian claimed that the blooms were extra large and very fragrant, the bloom stalks sturdy and long, leaves large, broad and decorative in themselves and a good sized

bulb which was prolific in making off-sets. For the time I had forgotten all about them, when out from a clear sky I received a letter from my friend who stated that he was selling out and was going to Australia to make his home and wondered if I would be interested in the *Eucharis* sports. They soon became my property and when they arrived were a sickly lot and I was quite disappointed with my purchase. Today, however, as you can see, they are beautiful beyond words and of course priceless to me. Dealers and tradesmen from several sections of the United States have approached me about purchasing my entire stock. I prefer, however, to grow them on and have a ready market, and a profitable one too, for all of the blooms that I can grow."

Mr. Thomas states that in a few cases some of the plants made their way into private hands and it is from these sources that so much comment is being made about their superiority over prevailing stocks. Palm Beach and Miami trade especially, demand a large number of cut blooms, such as *Eucharis*, during the winter season and it is at this time that the flowers of the *Eucharis* clone, *Julius Thomas*, are at their very best.

THE ENIGMA OF CYRTANTHUS VITTATUS (?)

HAMILTON P. TRAUB, *Maryland*

In 1939, Dr. Dyer gave reasons for questioning the authenticity of *Cyrtanthus vittatus* Desf. ex. Red. Lil. t. 182 (1807), a species based solely on a drawing (Herbertia 6: 65-103. 1939). While working with *Stenomesson* material, the writer noticed some similarities between the doubtful *Cyrtanthus* species and this South American Genus, and this may be a possible clue as to the original used by the artist, Mlle. Basseporte. It might be worth while to compare Fig. 4, Pl. 47, *Stenomesson coccineum*; Fig. 5, Pl. 47, *Coburghia incarnata* var.; Fig. 6, Pl. 47, *Coburghia splendens*; Fig. 1, Pl. 28, *Stenomesson flavum*, and Fig. 2, Pl. 28, *Stenomesson curvidentatum*, in Herbert's Amaryllidaceae, 1837; and also other plates figuring species of *Stenomesson* published subsequently. The description of *Stenomesson (incarnatum?)* by Dr. Goodspeed on page 28 of this issue of Herbertia is also worth considering.

WILHELMINA FREEMAN GREENE'S WATER COLOR DRAWINGS

We are indebted to the talented artist, Mrs. Wilhelmina Freeman Greene of Winter Park, Florida, for the Latin American Edition cover design featuring the Blue Amaryllis, *Amaryllis procera*. The design was made especially for this Edition and is intended to give an impressionistic picture of this rare and beautiful amaryllid. The artist has undoubtedly succeeded in achieving this objective to a remarkable degree.

Mrs. Greene's water color drawings of floral subjects are justly famous, and out of a long list, fourteen have been reproduced as color prints and are now available in the form of greeting cards. These color prints have but to be seen to be immediately appreciated—

Size of folder—4 1/4 by 5 1/2 inches:

Pitcher Plants—Sarracenia	Crown of Thorns; Bitter Aloe &
Turk's Cap Hibiscus	Bryophyllum
Hybrid Red Hibiscus	Parkinsonia and Bougainvillea
Hybrid Hibiscus—pastel shades	Frangipani
Dwarf Poinciana	Shell Flower
Ardisia and Brazilian Pepper	Water Hyacinth
Shaving Brush Tree	Flame Vine and Thunbergia
Jacaranda	Dombeya

Size of folder—5 by 6 7/8 inches:

Magnolia grandiflora	New Hybrid Hibiscus
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Size of folder—5 1/4 by 7 3/4 inches:

Royal Poinciana	Poinsettia
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Size of folder—5 15/16 by 8 1/2 inches:

Florida Tree Orchids and Tillandsias	A Composite Bouquet of Florida Wild Flowers
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Size of folder—7 by 9 1/2 inches:

A Bouquet of Florida Wild Flowers—74 species.

Mrs. Greene has the very laudable ambition of producing an illustrated book on subtropical flowers. Her aim is to interest children and the general public; in fact, all who want to learn visually rather than by studying technical works. She also hopes to find some one who will collaborate with her on a coloring and pasting book, "Around the World with Subtropical Flowers", for school children. Mrs. Greene writes—"I want to correlate it with the study of geography as Ditmars has done with the study of animals. I know that my children have some idea of the climate of Brazil for they know that the Flame Vine and Jacaranda both grow there. They have also begun to develop a knowledge of flower structure from drawing and painting them. Children learn by doing and seeing without realizing that they are learning. My children have also learned about birds from a bird game, and a stamp book of birds." Mrs. Greene's work is of such outstanding quality that publishers, garden clubs, parents' and teachers' associations, and other civic organizations interested in such patriotic undertakings should take advantage of this excellent opportunity. Mrs. Greene's address is Winter Park, Florida.

—Hamilton P. Traub

4. CYTOLOGY, GENETICS AND BREEDING

DAYLILY BREEDING AND TESTING ROUNDUP

As announced in 1939 *HERBERTIA*, brief articles, by some of those who entered the daylily breeding and testing field more recently, are presented. The information is put on record primarily so that those who grow daylilies may know more intimately the workers who produced some of the clones they grow, but also for the purpose of leaving authentic facts for the future historian of the daylily. In 1941 *Herbertia*, the roundup will be completed. All daylily breeders should send in brief articles about their experiences to the Editor. It is not necessary to wait for a formal request. Send in your article now. —*Ed.*

DAYLILY TESTING IN MINNESOTA

Robert Schreiner, *Minnesota*

There is a certain thrill in being one of the first to try a new plant, or member of a plant family in a region where this plant is comparatively unknown. This is especially true when the material with which you are experimenting gives promise of being of unquestionable merit. Minnesota is known throughout the country for its bracing climate. Real old fashioned winters and warm summers. The rainfall averages from 32 to 36 inches in a normal year with the summer months of July and August being our dry period. This is due to the fact that we are located at the edge of the Great Plains area where normal weather of dry summers is necessary to ripen the extensive grain crops grown there.

The two fold test on a *hemerocallis* in our section is, first, can it prove hardy in our climate of rigorous winters? Second, can it thrive during our "dry spell"? Our experience is that our warm sun, shining from a clear sky bleaches to nothing many of the varieties originated in the moister, softer climates of the Atlantic seaboard where a great majority of the varieties are being originated at the present time. So selection of durable color is essential with us.

The ability of *hemerocallis* to thrive and give a multitude of bloom during our hot and, more or less, dry summer months is certain to establish this splendid perennial as an indispensable unit to our flower gardens here in the Midwest. Public interest is awakening with genuine enthusiasm. Particular enthusiasm has been shown for the many-budded stems—some stems carrying as many as 115 buds!

Our *hemerocallis* season usually is ushered in by the more diminutive semi-dwarf species blooming about the season of the bearded iris. In our latitude this is about June 2nd to 15th. Two varieties that impress me among the more early flowering kinds are *Crown of Gold*, a soft yellow, airily fluted and the mellow tones of soft, orange *Judge Orr*. I should add to this a third variety, the true *Apricot* of Mr. Yeld. The variety sold in commerce is a nice *hemerocallis* and well appreciated but the true variety, practically unobtainable, is well worth uncovering.

Along with these very earlies, only a fortnight later, we have two creations of Mr. Betscher, originator of some very fine varieties. The two to blossom at this season are mellow *Earliana* and *Gaiety* with broad, open flowers, striking lemon yellow. It is very fragrant and I believe that this variety will merit the approbation some of his earlier, famous kinds have enjoyed.

Shortly after peony bloom season here, about June 22nd, we have another group of hemerocallis. Here we have varieties that come from the wizardry of several famous daylily hybridizers. One of the pioneers in Daylily development was Amos Perry of England. One of his earlier varieties which we value highly is *Iris Perry*. It is a rich shade of orange, cup shaped blooms held upright like an umbellatum lily. Its chief value is that it flowers for a long season. *Mikado*, by the dean of our hybridizers, Dr. Stout, does very well for us. It is another long season bloomer, often volunteering stems until October. Dr. Stout's *Serenade* is a dainty color. It may not be colored definitely enough for garden culture but its curly, twisted petals and delicate colors certainly make it a charming cut flower subject.

With the advent of July varied hues in hemerocallis greet us. Several of Mrs. Nesmith's striking creations flower. We particularly like the red tones of *Romany Lass*. Bicolored *Bold Courtier* is one of the outstanding new ones. A variation, more orange red, is dashing *Rajah* with its jewel-like center of embossed red. For a cheery color we like *Rosita*, quite rosy red, bright and very attractive. We have seen very few of the ambiguously called pink hemerocallis which did not leave us with a "let down". Using this year's bloom as a criterion, *Sweetbrier* was our choice. We would prefer to call some of the varieties described as pinks soft chamois-colored. Surely pink is a minor note in the color makeup. Two varieties having similarity in coloring are *Crystal Pink* and *Cleo*. Both are striking developments in this soft colored class and along with later blooming *Araby*, with its zone of brown in the center of the flower, represent one of the newest shades these plantsmen have given us.

We enjoy the variation in the form of hemerocallis and would dread seeing the form of this flower standardized as it is in the gladiolus. We enjoy for their variation in form and dainty coloration curly *Wau Bun*, embossed *Gloaming*, enticingly flecked; copious, full blooming *Mrs. A. H. Austin*, the broad star-like form of gilted *Golden Sceptre*. And who doesn't delight in the trim-cup shape of *Anna Betscher*, the huge, tubular, Easter-lily like trumpets of lovely *Sir Michael Foster*.

As our season progresses we come to late midseason kinds, August in Minnesota. Here we have a galaxy of stars that conjure up imaginations of Oriental splendor. Some of the striking developments have been in the red, rose and brown tones. High in merit rank *Dawn Play*; bright, festive, gay *Matador*—so brilliant it glitters. Much hybridizing has been done with the rose red form of *Hemerocallis fulva*—a varietal example is *Rosalind*. It is, in our estimation, finer than many of its children. It is a lovely color. Deep sonorous, brown-red *Wolof* has a

new tone, best planted near yellows as a foil for its slightly dull tone. Boldly patterned with touches of brown on yellow is deftly marked *Fulvalo*.

I have mentioned colors and tones of red mainly in this late blooming group. Of equal, or more, importance are the yellows and oranges. Indispensables at this season include *Hyperion*, a trumpet; *Sunny West*, fragrant and lovely. We consider *Golden Dream* one of the finest oranges and cannot understand why it is not more praised. Blooming for the first time *Nebraska* looks like one of the finest yellow varieties to come from Mr. Sass. Living in the heart of the Midwest, Mr. Sass has given us some striking creations embracing already mentioned *Sunny West*. *Nebraska* has long, tubular blooms. *Star of Gold* is the long spreading petalled type, very pleasing. *Golden West* is well liked down East. Here it does not seem as striking. Perhaps with *Nebraska* his other most unique development is *Hesperis*, a hemerocallis of rare form—creamy yellow, almost cream white.

To us one of the most important sections of hemerocallis are the extra late flowering kinds. After a long dry summer flowers are at a premium and the perennials are in need of flowers. Thus extra late blooming kinds, blooming for us from August 20th to as late as September 20th, are a class especially enjoyable. The few varieties are divided roughly into two classes, the very small flowered Multiflora hybrids, best examples are orange and brushed red-brown *Boutonnaire*, more pure orange *August Pioneer* and pure yellow *Buttercup*. Each is valuable for their season and their many budded stems. With us *Hankow* is late, a fulvous colored kind of the species *H. fulva*. It has bloomed very late for us twice. Our most striking late bloomer was the variety *Dorothy McDade*. It has larger flowers than others, is a pure yellow of nice trumpet shape. An origination of Hans Sass, all rights are owned by Mr. Clint McDade of Chattanooga, Tennessee who is specializing in the very late blooming hemerocallis. Some interesting new developments are promised from his work.

Let me conclude by saying this review does not attempt to cover the entire variety field. It rather embraces the varieties I have grown and observed myself. This year I added to my collection over 36 new kinds. So we await next years bloom with pleasant anticipation.

DAYLILY BREEDING EXPERIENCES

J. Marion Shull, *Maryland*

My interest in daylilies seems to have grown quite naturally and almost imperceptibly out of a long experience in Iris breeding, which I had been carrying on for more than a dozen years with a fair degree of success. A student of genetics, always keenly alive to manifestations of heredity, it implied no great diversion of interest when in 1927 I turned to the daylilies and made my first deliberate crosses.

Well aware of the seed sterility of *Hemerocallis fulva* I made no wasteful attempts to produce seed on this, but used its pollen instead,

on *H. Thunbergii* (= *H. serotina*). A number of plants resulted from this cross but only one differed materially from the seed parent. This one, however, fairly shouted its hybridity. It was so unlike either parent, not as large as *H. fulva* but with considerably wider segments, a good bright orange overlaid with a close flecking of red, a "fuller" flower than either parent, in fact so different that my interest was immediately engaged to use it further to see what might come out of succeeding generations.

I first pollinated this with a clone acquired under the name of *Florham*, probably one of the sisters issued carelessly under that appellation all of which are now shrouded with some uncertainty. Later other clones were used with this same hybrid. Only an occasional pollination proved successful, perhaps one in twenty, but the resulting progeny displayed the expected variability and so my interest in day-lilies grew.

Then in 1933, by arrangement with Mrs. Nesmith I obtained from her Fairmount Gardens at Lowell, Mass., a number of the choicest things then available, the aim being to acquire, not a large collection but the best of varying types. These, combined with my hybrid "Thulva" are the basis of more recent work.

SELECTIVE BREEDING OF HEMEROCALLIS AT THE UNIVERSITY OF FLORIDA

John V. Watkins

Assistant Professor, Horticulture

University of Florida

For more than a decade the hybridizing of Daylilies has held the attention of the writer and thousands of pollinations have been made on plants growing in the Daylily Display Garden on the campus of the University of Florida. This collection, which comprises one hundred and thirty-four of the leading commercial varieties, has been assembled here for study and for demonstration. Pollinations have been made with a view to the origination of seedlings which would have, it was hoped, specific characters thought to be of value to southern gardens.

Two lines of attack, only, were followed. The aim of the first is toward the production of a seedling that will bear flowers of a clear, sprightly red with wide, heavy petalage that will not disintegrate in the Florida sun. Crosses were made with pollen from wildlings from China upon blossoms of a commercial variety of good form. After careful evaluation of the hundreds of seedlings that resulted from the crosses, all were discarded save one. This plant was retained, critically observed for four years under Florida gardening conditions, and, last spring was described in HORTICULTURE. This Brazil-red Daylily was named in honor of Mrs. John J. Tigert, the wife of the President of the University. Further hybridizing within this same strain of Hemerocallis is being carried on intensively, and additional selections will be made as the seedlings are of sufficient merit to warrant introduction.

The aim of the second line of selective breeding was toward the creation of a variety that would bear tiny, cherry-red blossoms on scapes that were but a foot in height. Hundreds of pollinations have been made in an attempt to breed a miniature Daylily of this description and a stock of parent plants has been built up after five years of intensive effort. None of these miniatures is sufficiently dwarf, none bears flowers that are tiny enough to fulfill the original ideal, although visitors have been unanimous in their praise of certain of the seedlings in this strain.

Every blossom that is produced by these liliputians will be self- or cross-pollinated in an attempt to create the Daylily that most nearly resembles a cherry-red Freesia.

In this program no work is being carried on with the plants that bear yellow or orange blossoms, no pollinations are being made which might result in the much-wanted white Daylily, nor are there lines of attack being pursued which might result in bi-colors or large flowers in the clear pink shades. The writer has observed many excellent seedlings in the gardens of other hybridizers which might well fill the needs in these categories.

THE NESMITH DAYLILIES

Mrs. Ethel P. Dewey, *New York*

Elizabeth Noble Nesmith, (Mrs. Thomas Nesmith) of Fairmount Gardens, Lowell, Massachusetts, has a garden full of beautiful daylilies (*Hemerocallis*) which she has spent years to collect and breed.

About 1926 she began the work of hybridizing with such available clones as *Apricot* and *Ophir* and the well known *H. flava*, *H. fulva*, and *H. citrina*. When a fairly large number of Betscher hybrids were introduced by the Bay State Nurseries in 1929, she obtained and used them to breed extensively as well as a considerable number of clones from Mr. Amos Perry of England which she imported in 1932 and 1933.

Being fortunate enough to receive divisions of *H. fulva rosea* (No. 1 and No. 2) in 1932 she was able to make crosses for pink-hued blossoms.

Through experience she found that *H. fulva rosea* had a tendency to break down the size of blossoms used as parent plants and later used only very large flowering clones for these crosses. *Imperator* because of its excellent branching habit and *Golden West* because of its substance, she found invaluable. *Cissy Giuseppe* has been extensively used for some shades of pink but especially for purple hues.

Mrs. Nesmith's selections of hybrids have been made from thousands of seedlings over a period of more than ten years and her first offer of daylilies was in her catalogue of 1931. At the present time she considers her breeding of *Hemerocallis* her most interesting work.

The following five varieties include both early and late flowering selections: *Crown of Gold*—clear deep orange, May and June; *May Morn*—orange yellow, May and June; *Golden Dawn*—large orange yellow, June and July for the rockery; *Springtime*—clear orange, mid-

rib lighter, May and June; *Romany Lass*—dark mahogany—red with purple zones and gold throat, August.

Many pink-hued daylilies are listed among her hybrids: *Pink Lustre*—large, flesh pink with creamy midrib and lustrous sheen, July and August; *Crystal Pink*—flush pink, deeper eye zone and pearly lustre; *Sweetbrier*—fresh pink of better form, and more branching than *Rosalind*; *Dolly Varden*—beautiful chinese coral pink with rosy lines and frosty sheen, July and August.

Deepening in color from rose-red to dark purplish red are: *Tartar Prince*—early, maroon purple extending deep into the throat, June and July; *Burning Star*—Nepal red like a ruby red lily, August; *Dawn Play*—velvety rose red with gold heart 50", July and August; *Persian Princess*—very deep red, over flushed purple, with sepals a shade lighter, rich, golden throat; *Petra*—wide reflexed petals of glowing rose, sepals yellow heavily over-flushed rich rose, deep yellow throat, August. This last mentioned daylily is considered by Mrs. Nesmith as her finest introduction of the darker colored daylilies.

Outstanding in her garden in July was *Bold Courtier*—A very large flower with long petals of Pompeian rose with creamy midrib. The petals are very broad and full at the throat. The sepals of soft yellow are strongly recurved and very slightly flushed with rose near the throat. The effect is a very large and beautiful bi-color.

The nearest to white in color of any hemerocallis I have ever seen is Mrs. Nesmith's description of *Starlight*—a tall well-branched daylily with flowers of palest yellow, July and August. *Summer Eve* should not be omitted from the list of hybrids from Fairmount Gardens. It might well have been named "Cinderella" for it changes into new colors in the late afternoon. The morning finds the new flowers a pinkish hue of orange which do not deteriorate but change into a soft apricot of peach pink. Not all of the blossoms change at the same time so that the plant often appears to have two distinct sets of flowers. The blossoms are full and of good size.

A critical examination of the hybrids introduced at Fairmount Gardens shows that careful, intelligent thought has been the basis of the breeding program. The standards of evaluation have been raised year after year as they have with other hybridizers.

There is perhaps shown here more of what I choose to call the "human element" in the release of some of the earlier hybrids. The desire to share with others the best which we have at a particular time. The transformation from the old Lemon Lily to a perfect hybrid of some five generations or more of breeding is too great a feat for rapid accomplishment, and the plant amateurs are only too glad to have the best selections as each step in advance is made. To wait for ultimate perfection before making any introductions would deprive the gardener of much joy and happiness.

Mrs. Nesmith is one of the pioneer breeders of pink and red-hued daylilies and she has had the courage to name and introduce numerous daylily varieties. She has released and listed them for sale in her

catalogue year by year as they were gradually developed. There can be no doubt but that she has done much for the improvement of the daylily and for the advancement of popular appreciation of daylilies.

HYBRIDIZING DAYLILIES IN FLORIDA

WYNDHAM HAYWARD, *Florida*

A number of influences led to the writer's interest in the possibilities of breeding daylilies under the favorable conditions of a sub-tropical climate. Familiarity with the commonest kinds in the home garden in New England when a child, their close affinity to the Amaryllids, which becomes apparent to anyone who has worked with the latter flower, and the inevitable instinct to work with a promising decorative garden plant, were some of the inducements.

About ten years ago the writer saw a clipping from the New York Times describing some plants of rosy-pink daylilies that Dr. A. B. Stout was growing and hybridizing at the New York Botanical Garden. At the same time he received some plants of *Hemerocallis fulva* cl. *Kwanso*, the double clone, from the Henry Nehrling collection in Florida, and he enjoyed several discussions in the matter of breeding hemerocallis with the late Theodore L. Mead, of Oviedo, Fla., who had grown a number of early types and produced one named clone, *Chrome Orange*, which still has merit as a garden clone under proper conditions.

From the Farr Nursery Company about nine years ago were obtained plants of Dr. Stout's first group of named clones, *Mikado*, *Soudan*, *Vesta*, *Cinnabar*, and *Wau-Bun*. These proved all to be evergreen, and thrived under Florida conditions. About 1935 and 1936 a few hand-hybridized seedlings were grown, and other clones of the leading breeders of daylilies were added to the collection. Dr. A. B. Stout donated a number of plants of unusual and standard horticultural clones, and wild types to the University of Florida and the American Amaryllis Society trial collections in Florida and gradually these became available to growers over the state through exchanges and test distributions. Included in these were *H. fulva* var. *rosea* (*Rosalind*) and *Vulcan*, and in common with several other hybridizers, the writer undertook the breeding of the darker colored and rose-pink hemerocallis hybrids.

One of the best of the early seedlings that the writer bloomed after 1935 was the clone named *Araby*, which still seems attractive to many garden lovers. One of the most recent is *Emperor Jones*, a dark mahogany red which has been sensationally popular. Others of the writer's introductions which have met with some favor are *Cleo*, *Rosita*, *Minnie*, *E. W. Yandre*, *Old Rose*, *Florida*, *Osceola*, etc.

In breeding, it has been the intent to use only the best types and finest clones for color and shape combined, so that good form will be paramount in the results. The daylily world is cluttered with nice colored flowers of indifferent form. Only rarely in the seedlings does the happy combination of fine form and good color appear. Distinctive shape will make a daylily of inferior color outstanding and attractive.

Of course bad color as muddy, dirty tones and clashing, screaming hues are to be avoided.

Even using the best clones of Dr. Stout, Amos Perry, H. P. Sass, Carl Betscher and others it has proved to be a slow and tedious process to arrive at anything really new and distinctive. One or two seedlings out of each batch of several hundred or several thousand will prove worth keeping. The grower must be rigorous indeed in his discards. An outstanding new seedling hits the eye with a shock in a field of mediocre results. Not even one tenth of one per cent of the seedlings from the apparently most promising breeding material will be found top-notch.

Florida has peculiar advantages over northern climates for the breeding of daylilies, especially evergreen kinds, as are most of Dr. A. B. Stout's. Incidentally, the evergreen kinds are best for garden use in the lower South and warm climates generally because of the decorative value of the foliage in the winter months. In Florida evergreen daylilies will grow every month of the year, and seedlings may be pushed and flowered in one year from the date of planting in some cases. Sometimes, however the best types in a batch of seedlings will not flower for two or three years, so care should be taken not to throw away a batch of seedlings too soon.

DAYLILY NOTES FROM WEST VIRGINIA *

LEON H. LEONIAN, *West Virginia*

Growing daylilies from seed is rapidly becoming a fascinating pastime because ordinarily there are few duds among the ensuing seedlings. As it takes considerable will power to discard so many nice seedlings and keep only one or two superior plants, soon we will be facing the danger of too many named varieties and the subsequent chaotic condition in the classification and evaluation of daylilies. If things continue at the present rate, there will be hundreds of new varieties dumped onto the market within the next few years. For instance, this year thirty-six new varieties were introduced by one person alone. Many old and new breeders will undoubtedly follow suit in order not to be outdone, and some poor souls are going to have an awful headache trying to separate the grain from the chaff.

I must confess that I am not qualified to speak authoritatively about the numerous varieties of daylilies—in the first place, having devoted all my attention to fulvous sorts I know next to nothing concerning the yellow and orange colored varieties, and in the second place I have only a limited experience with the fulvous *hemerocallis*. I cannot expect to grow and even to see all worthwhile reds and pinks of other breeders because many of these are as yet unreleased, others are jealously guarded, still others have different periods of blooming so that one would be obliged to make several trips to the garden of a given breeder, and

* Being under contract, I am not at liberty to sell, exchange, or give away seeds or plants of daylilies developed by me.

finally some are mere wishful thinking, existing only in the bright imagination of some persons. Therefore what I have to say in this article should be considered the opinion of a daylily lover rather than that of an authority.

Many gardeners prefer yellow and orange hemerocallis to fulvous types not because they are prejudiced against reds, but because they realize that the quality of the yellow and orange tones in this flower is infinitely better than the quality of the reddish ones. The yellow of daylilies is not surpassed by other yellow flowers, but the red of fulvous varieties is surpassed by the quality of red of other flowers. Generally speaking, the red of hemerocallis carries too much of the brownish and mahogany tones, too much muddiness, and consequently is shallow and dull. The red of tulips, of roses, of dahlias, or of poppies is far better red than that of the reddest hemerocallis. As concerns the pinks, we seem to be much worse off. The pink of hemerocallis does not at all compare with the pink of carnation or of the rose; it is a shallow, dull pinkish tone; it has a long way to go to be a clear and sparkling pink. I realize that some breeders will have superior smiles on their faces when they read this, but I also realize that everyone imagines his duckling to be a swan. Witness some of the catalog descriptions; one would think that perfection was achieved already and there was nothing more to do.

My first acquaintance with "red" hemerocallis began with Cissy Giuseppe. It was described so poetically and with such bubbling enthusiasm that I could not resist, and purchased a plant at a ridiculously high price. What a rude awakening followed when the mean little flowers opened for me! Since then I have grown and watched a number of fulvous varieties; some proved to be bitter disappointments, others pleasant surprises. I have been particularly well impressed with four varieties that were developed in Florida: *Dr. Stout*, *Victory Taierhchwang*, *Emperor Jones*, and *E. W. Yandre*. The first two were introduced by Dr. Traub, and the latter two by Mr. Hayward. They stood our cold months well, and although last year we had a long and very severe winter, these Floridians came through with flying colors and flourished vigorously. The daylily *Dr. Stout* opens in the garden like a veritable sunburst, remaining bright and fresh all day. The flowers are large, well formed, well displayed, produced in abundance, and have a unique and pleasing coloring, sunburst infused with streaks of red. It should be seen in order to be appreciated. This variety is described as a recurrent bloomer in Florida, but with me it blooms but once.* Recurrent blooming habit may be very nice, but well established plants may continue to bloom for a long time. For instance, some of my own seedlings begin to bloom in June and continue well into September. *Victory Taierhchwang* is a showy, vigorous, and floriferous plant. The color of the flowers is described as Spanish Wine, but I would like to have it a bit clearer and possessing more sparkle. However this variety should have a place in the garden particularly in view of

* Clones that are recurrent bloomers in central Florida may not behave similarly in regions with shorter growing seasons. —Ed.

the fact that it retains its color fairly well throughout the day. Mr. Hayward's *Emperor Jones* is a very dark colored daylily, a deep mahogany red rather than "purple-black," and in common with other daylilies of the same coloring it does not stand the sun well. This is a large-flowered, showy plant and will perform well in cooler climates and in partial shade. *E. W. Yandre* is a very outstanding thing because of its flaring type flowers and wide petals. If instead of fulvous-bronze this variety possessed a clear ruby red coloring, it would be hard to surpass; but even so it is a distinctive daylily.

My own efforts have been centered on color quality rather than on any given form of flower. The development of clear, sparkling colors and the extension of color range are our greatest needs in daylily breeding. We should endeavor to eliminate brown from the red and substitute purple, then to intensify and eventually to segregate the purple from red. From then on a train of fascinating possibilities would be set in motion. I have made some progress, but much remains to be accomplished. Old rose, lavender, and magenta shades are now being evolved, but these have a long way to go before their tone quality can be considered as satisfactory. Clear ruby reds and scarlets, and very deep, blackish-maroons have progressed more than others, and deep rosy pinks in sparkling colors are beginning to show, but all of these are mere beginnings and the ideal color is still in the future.

In the not very distant future all of us will have our maroons, our reds, and our pinks, and one red will appear very much like another red, one maroon like another, and one pink like another pink. It is not going to be possible to control duplications because no sooner is some promising variety released than it is grabbed by every breeder and freely intercrossed with other varieties. As no one has a corner on breeding methods, many excellent varieties are certain to be developed and eventually released. As red, maroon and pink colors become common, the alert breeder will endeavor to turn out varieties so different from all others as to focus upon themselves the admiration of all daylily lovers. From now on it is going to be very difficult, if not impossible, for any one breeder to tower over all others in the development of exciting new varieties. The pioneers have cleared the way and have furnished the basic breeding material. No longer need we grow seedlings by tens of thousands in order to select a few promising things; judicious crosses made between some fine varieties will often yield a surprisingly large number of good reds.

I think that more attention should be devoted to the production of blends. I do not mean bicolors but such things as pastels where two or more colors are fused into an attractive whole. It is my prediction that good pastels are going to have more admirers than reds. Also the possibility of a great many combinations of pleasing shades is going to enable the breeder to extend himself as far as possible. Sometimes the blends become very intriguing; for instance, some of my own seedlings at first glance appear to have an odd shade of soft yellow, but upon closer examination one comes to the conclusion that there is a glow of salmon, and a hint of pink somewhere showing through the yellow.

Most people like bicolors, but unless the two shades are well matched, much of the attraction of this type of flower is lost. Often the basal spots of reds on a background of yellow appear like hastily applied patches. Instead of a sharp differentiation, I would prefer to have the red gradually diffuse into the yellow. One of my own seedlings that appeals to me very much has a combination of soft lavender and pale yellow, very nicely balanced on broad, flaring sepals and petals. Reddish purple and orange combinations in others offer the warmer aspects of bicolor daylilies.

The form of individual flowers has great weight with most breeders. The consensus of opinion seems to be that wide-petalled, flaring flowers are to be given preference over the narrower sorts. My plea is to break away from dogmas. Standardization may be all right in breakfast foods, in drug stores, and in tooth pastes, but why introduce it into the flowers? It is true that wide petals and flaring habits make the flowers appear larger and more showy, yet it is equally true that well formed, nicely curved back, and narrow-petalled flowers are more graceful. When several flowers of this type appear in clusters they seem like gigantic azalea blooms and are very attractive indeed. If well proportioned and well balanced, any floral type will have its followers.

WHY I AM INTERESTED IN DAYLILIES

ELMER A. CLAR, *Illinois*

Gardening is a hobby of mine. I am not even a good gardener but I do have a lot of fun with it and I would like to have a maximum amount of fun with a minimum amount of work.

My garden is on a corner lot which in size is one hundred by two hundred feet. It has nine large trees on it, some of them with a diameter of between 2 and 3 feet. Being a corner lot, there are also a number of additional trees on the lawn area so there is considerable shade. I love the trees and I would not be without them. Among the plants that I am growing are iris, delphiniums, peonies, roses, mums, phlox, dahlias, tulips and daylilies.

I am very fond of iris but on account of the large amount of shade on my lot I have had to constantly pamper them and I have had an excessive amount of root-rot and borer. I do wish the hybridizers would develop a strain of iris that would grow in the shade. They are so beautiful that I shall always try to grow them.

Delphiniums are very beautiful but I lose a considerable number of my plants each year. I shall let somebody else raise them from seed. I shall buy the plants, enjoy their bloom and replace them when they die.

Peonies are wonderful flowers. Starting with the species, I have bloom for two months. It must not rain when the big doubles are in bloom or each flower must be staked. The sun must not get to some of those with the highest ratings or the lovely pinks and yellows will become

a faded white. The only way that you can see many of them at their best is to cut them and take them inside away from the sun. However, they require a minimum of care and are one of my enduring favorites. I shall always have peonies.

I am very fond of roses but they must be sprayed every ten days, fed often, never watered with an overhead watering system but have the water applied at the roots, cultivated regularly and not fed after August. They are beautiful and worth every effort necessary to maintain them. I shall always grow them.

For the life of me, I can't keep rust and mildew off of phlox and mums but I love them and my present attitude is that I shall always keep trying.

Dahlias are beautiful with a tremendous range in colorings but you must hitch them to a post which does not look well in any garden and you can raise them best under cloth. One should spray, feed and cultivate them regularly. I lose many tubers in storage in winter. I'll have a few big ones in my garden but I like the dwarfs best.

I tried to raise gladiolus but the thrips destroyed almost all of my flowers. Spray them once every ten days to overcome this and feed them regularly. They are so irregular in growth that I will not grow them in my garden but they can't be surpassed in a bouquet. I can hardly pass a florist shop without stopping when I see a bunch of *Picardy*, *Minuet*, *Maid of Orleans* or *Golden Chimes*.

I heard of daylilies (*Hemerocallis*). *Hemerocallis* means "beautiful for a day." This a very inappropriate name; it directs attention to the least desirable fact about the flower. It would be just as if we called glads "thrips" or Iris "root-rot". Daylilies will stand neglect, insect pests, lots of rain, lots of drought and you don't have to have sprays or any special cultural requirement. They will grow in any location, sun-baked or partly shaded; soil rich or poor, acid or alkaline, sand or clay. Plant them almost any time and they thrive. I actually received a shipment from Mr. Amos Perry in England in December that were outside with no special protection, except a few leaves, but the plants all lived. Daylilies "Can take it" but, like everything else they do best when you are kind to them. They are available at varying flowering seasons in a wide range of heights and colors; lovely colors like pink, rose, raspberry, red, maroon and ivory, bi-colors with vividly contrasting segments—alternating three petaloid segments of cherry red, maroon or brown and three sepaloid segments of ivory, yellow or orange. Many of the flowers have a number of different colors. Many have one color overlapping another color, like shot-silk. The flowers are as large and as fine as the finest lilies and are borne in greatest profusion, a single scape having as many as 20 flowers with large numbers of scapes to an established plant. One plant may have several hundred flowers during a season and at one time a great many flowers will be open.

However, what is most important to me is that they will grow in my garden under my trees and that I do not have to harness myself to a dust or squirt gun or a hoe or feed-bag to enjoy this flower. They are

at their best when the heat and drought of July and August have parched the lawn and when our other favorites are out of season. Buy a few of the new hybrids and you will soon be lustily singing their praises.

My daylily breeding work is in its infancy. I have over 1,000 seedlings but up to the present time have not introduced any clones.

DAYLILY BREEDING IN SUBTROPICAL FLORIDA

HAMILTON P. TRAUB, *Florida*

The writer was infected with the daylily fever by association with Mr. Wyndham Hayward. Although a valiant struggle was put up, bringing to bear all the old arguments about the lack of versatility in daylilies, and so on, resistance was entirely hopeless. Mr. Hayward made an extensive collection of species and clones, and soon he had a few enthusiastic converts, including the writer and Mr. R. W. Wheeler, in Orange County, Florida. The writer started active daylily breeding operations in 1933, and found that very rapid progress could be made under Florida conditions. Many seedlings under excellent growing conditions bloomed in 11 months, and practically all flowered at the end of the second season after sowing seeds.

The growing of daylily seedlings is fairly simple. The seeds are planted in flats as soon as harvested, beginning in May for the earliest flowering sorts. The flats, 20 inches long, 12 inches wide, and 5 inches deep, are filled to a height of 3½ inches with a very rich potting soil. A ¼ inch layer of coarse sand is spread on top of the soil, and the seeds are strewn thickly over the sand, and sand to a height of ¾ inches is added. The flats are covered with window-screens to keep off birds, mostly Blue Jays, Mocking Birds, and Thrushes, insects, snails, and rodents, and are set in the full sun.

The tropical rains that beat down on the small seedlings almost daily during the summer, water-log the soil and cause mechanical injury to tender seedlings. The purpose of the sandy layer is to provide a well-drained place for the crown, and to minimize any rain-caused mechanical injury.

From September to November, the seedlings are transplanted for testing in soil, enriched with well-rotted manure. They are spaced 3 inches in the rows that are 8 to 12 inches apart. Regular fertilization, every four months, with a mixture (at least 1 to 1½ tons per acre) of 4 per cent. nitrogen (half from organic sources), 8 per cent. phosphorus, and 6 per cent. potash, and small amounts of the micrometabolic elements zinc, copper and manganese, as sulphates, is advisable on the sandy soils of central Florida.

The seedlings are not molested by grasshoppers or other insects, except that when quite small they are relished above all other vegetation by a small sluggish leaf cutting ant that seems to exist in small colonies. The large Lubber grasshoppers that devour other amaryllids never touch daylilies. We may presume that the daylily contains a compound or compounds that are harmful to such insects, and attempts to isolate such

compounds for use in insect extermination may be worth while. It is also worth noting that comparative protection has been secured for insect susceptible amaryllids by planting them among daylilies. Apparently the grasshoppers are fooled by this method of camouflage. When the plants are fully grown and in flower, a green, katydid-like insect sometimes rasps open the seed capsules, and devours the seeds, but as a rule only a relatively few capsules are affected. The small pollen-gathering insects, *Halictus reticulatus*, regularly visit the daylily flowers and by noon have carried away most of the pollen. If crosses are made with pollen gathered early on the previous morning, these depredations are of no importance.

The daylily breeding program will be intimately bound up with local climatic conditions. In central Florida, the early flowering clones begin to bloom in the middle of February and continue on through March and April. These are followed in May by the "mid-season" clones, and most of the late ones bloom in June. Most clones are recurrent bloomers in Florida, and the season extends into September. However, after July, the amount of bloom is considerably reduced. At present we have no clones that flower in October through January, although the evergreen types will make root and leaf growth during these months. Occasionally some of the earliest clones—*Queen of May*, *Domestico*, etc.,—will bloom in January, but this is quite unusual. Some species, and clones developed in the North, are unsuited to the subtropics. Most species, and clones like *Cissy Giuseppe*, sulk and remain dwarfs. Clones like *Midas* refuse to live, and *Wau-bun*, *Soudan* must be watered during the flowering season (spring) for good results in a region with tropical rains in summer and semi-arid climate in winter and spring. Clones like *Mikado* and *George Kelso*, however, thrive under the utmost neglect.

The daylily breeding program for central Florida therefore will differ somewhat from that of more northerly regions. Such evergreen types as *Hemerocallis aurantiaca*, and *H. aurantiaca* var. *major* will be much used in crosses, and an attempt will be made to secure drought resistant, very early and late flowering clones. Recurrent blooming will also be sought since each new flowering period gives finer flowers than those produced toward the end of a single extended blooming period. The objection to daylilies in the past has been mainly that they were too definitely typed, and that in the color range there was too much yellow and orange and fulvous. The first consideration should therefore be *to extend the color range, and to secure more subtle coloring*. In shape too there is need for greater variety. In fact the objective to be sought is the greatest possible variation in all characters so as to make the daylily more generally useful in the garden, as a cut-flower, and in landscape design.

The breeding method adopted was based on the objectives in view. Dr. Stout had already made a study of inheritance in the daylily and his results will undoubtedly be given to the public sooner or later. It was therefore not necessary to duplicate this work, and the efforts could be concentrated on the task of securing in the shortest possible time the greatest variation in all characters. If pollen from one pollen parent is

Table 1. Hybrid Daylily Clones originated by H. P. Traub, 1933-1940, inclusive.

Stature, clone, and year of introduction	Numerical rating ¹	Dominant flower color ²	Flowering date ³	Foliage character ⁴
DWARF—below 1 ft.				
None introduced.				
SEMI-DWARF—1 ft. to 2 ft.				
Cecil Houdyshel (1939)	T8.0	Doge Red (4-K-9)	May-I	E
Corinne Robinson (1939)	T9.0	Very light pastel pink (Etruscan, 4-G-11)	May-I	PE
Helen Wheeler (1940)	T8.5	Pastel pink (Etruscan)	May-II	E
Rouge Vermillion (1940)	T8.6	Rouge Vermillion RHS-19	May-III	PE
Theodore Mead (1940)	T9.8	Saffron Yellow RHS-7/1	Apr.-I	E
Wekiwa (1938)	T9.5	Rich velvety red	Apr.-III	D
SEMI-ROBUST—2 ft. to 3 ft.				
Carnival (1939)	T9.6	Moro Red (7-L-10) Aureolin throat	May-II	E
Charlotte Traub (1938)	T8.5	Emberglow (3-G-10)	Apr.-II	PE
Dr. Hughes (1938)	T9.0	Orange, suffused vinaceous rufous	May-I	E
Duchess of Windsor (1937) ⁵	T9.8	Refined light orange with polychrome sheen	May-II	E
Estelle Friend (1939)	T8.0	Burmese Gold (3-C-11)	Apr.-I	D
Fire Red (1940)	T8.8	Fire Red RHS-15	Jun.-I	PE
Fred Howard (1939)	T9.5	Clear Ember (5-K-10)	Apr.-III	PE
Gloriosa (1938)	T7.6	Algerian Red (5-L-10)	Apr.-I	E
Golden Glow (1938)	T8.6	Rich Golden Glow (9-L-6)	Apr.-III	E
Granada (1938)	T9.0	Monterry Red (5-J-12)	Apr.-I	E
Happiness (1938)	T8.5	Bright coppery-rose	Apr.-I	E
John Blaser (1939)	T8.8	Clear apricot (9-K-5)	Apr.-I	D
La Tulipe (1939)	T9.6	Dark Cardinal (6-L-8) sulphur throat	Apr.-II	E
Lena Hughes (1938)	T8.0	Salmon rose	Apr.-I	E
Mauve Rose (1938)	T7.5	Mauve Rose (7-E-5)	Apr.-II	E
Mayor Starzynski (1939)	T9.5	Glistening bronzy-rose	Apr.-II	E
Mildred Orpet (1939)	T9.8	Peach Blush (5-C-11)	May-I	E
Peony Red (1939)	T9.0	Peony Red (6-J-6)	May-I	E
Reba Cooper (1939)	T8.5	Sunrise (10-C-7)	Apr.-I	E
Victory Taierhchwang (1938)	T8.7	Spanish Wine (7-J-6)	Jun.-I	E
ROBUST—3 ft. to 5 ft.				
Audrey Blaser (1939)	T7.8	Sunkiss (9-K-9) suffused rufous	Apr.-II	E
Dr. Stout (1938)	T9.8	Sunburst, suffused Moroccan red (5-K-11)	May-III	E
Elaine (1938)	T9.0	Delicate light salmon rose	Apr.-III	PE
Emberglow (1940)	T9.0	Pale yellow shot Emberglow	May-II	E
George Kelso (1940)	T9.6	Orange, suffused bronze	Apr.-I	E
Indian Chief (1938)	T9.6	Totem Red (4-J-12)	May-I	E
Queen Wilhelmina (1940)	T8.6	Cadmium Orange RHS-8/1	May-II	E
Russell Wolfe (1939)	T8.5	Near Spanish Wine (7-J-6)	May-II	E
San Juan (1938)	T9.1	Very deep Spanish Wine	May-I	PE
St. Joan (1939)	T9.0	Moroccan Red, golden halo	Apr.-I	E
Victory Montevideo (1940)	T8.5	Chianti (6-L-6)	Mar.-I	E
Victory Suomussalmi (1940)	T8.8	Orange, suffused rufous	May-II	E
GIANT—Above 5 ft.				
None introduced.				

¹ The "T" before the rating indicates that this is the breeder's own rating under the conditions of High Hammock Orlando Fine Sand in Central Florida, and is not to be confused with any symposium ratings that may be given later. All of these clones were selected for the subtropical southeast, particularly central Florida.

² Color descriptions are based either on Maerz & Paul, *Dictionary of Color*, (initials not indicated), or on *Royal Horticultural Society Colour Chart* (initials "RHS" indicated).

³ The approximate flowering dates are for central Florida; figures after months indicate: I=first 10 days (1 to 10); II=second 10 days (11 to 20); III=third 10 days, more or less, (21 to end of month).

⁴ E=evergreen; PE=partly evergreen. D=deciduous.

⁵ Originated by H. P. Traub, and donated to Mr. Wyndham Hayward. Mr. Hayward named it in honor of the Duchess of Windsor by permission of the Duke of Windsor. Mr. Hayward introduced it in 1937

used in making a cross on a seed parent, the number of combinations secured in one generation is reduced to a minimum, but if more kinds of pollen are mechanically mixed and applied to many seed parents then the number of possible combinations will be correspondingly increased. Although a limited number of crosses of the first mentioned type were made and duly recorded, the great majority of crosses were of the second type, and the results were quite up to expectations.

Between 6 and 7 a. m. in the morning during the flowering season, pollen was gathered from 20 or more clones and species, spread out in paper trays and allowed to dry indoors until the next morning when the dried anthers with pollen were put into a small gelatine capsule and the mixture was thoroughly shaken. Using this mixture, crosses were made early in the morning, except in the case of night blooming clones, in which case the pollinations were made in the late evening. From these crosses the writer secured a bewildering array of progeny that defied classification. Once the great variety of combinations had been produced, the next step was to single out the most desirable ones for further breeding work. This was a very difficult task for all the progeny were quite beautiful. It was not a question of the beautiful and more beautiful but rather that of the most beautiful. In most cases much attention was also given to constitutional vigor and floriferousness. Obvious colors were discarded in favor of more subtle, orchidaceous combinations.

Out of the first 10,000 seedlings only 0.8 per cent were selected for further study, and only 38 were named and introduced. The 38 clones are listed and very briefly characterized in Table 1. In the table, numerical ratings have been used to evaluate the clones as they grew in the writers garden at Mira Flores, Orlando, in central Florida, on Orlando fine sand, high hammock phase. An attempt was made to be as severe as possible. Only 16 of the 38 clones rate 9.0 or above; 16 rate 8.0 to 8.9, and 5 from 7.5 to 7.9. No clones rating below 7.5 have been retained. These ratings are entirely personal and should not be confused with any numerical ratings that may later be given by the Daylily Committee. Only 8 clones—*Mildred Orpet*, *Duchess of Windsor*, *Carnival*, *George Kelso*, *La Tulipe*, *Indian Chief*, *Theodore Mead* and *Dr. Stout*—rating above 9.5, are considered as approaching perfection. Many of the other clones are quite outstanding in some particulars, but may be lacking in others.

At the present stage in daylily breeding, it is important to retain certain clones for particular characters such as time of flowering, new colors, new flower shapes, etc. By making these available to other breeders, the improvement of the daylily will be speeded up very much. We need but to mention Hayward's clone *E. W. Yandre* that is being used by a number of breeders. From the standpoint of the advancement of the daylily, Mr. Hayward has done a great service in unselfishly sharing with others this new break in flower shape. The writer attempted for some years to secure very early flowering reds, but progress was slow for there was little to work with. By utilizing *Queen of May*

as a pollen and seed parent,, a clone with this habit and Chianti color was finally produced, and introduced as *Victory Montevideo*. This blooms in March and February and gives much needed variety during the early season in Florida. It is being used as the basis for additional breeding for very early reds and pinks.

In considering the whole group of 38 clones introduced, the writer is often asked to indicate the most outstanding. In the following brief appraisal, only a few clones will be mentioned as typical. From the standpoint of delicate and subtle coloring, *Mildred Orpet* is worthy of note. The color is beautiful in the early morning but improves as the sun beats down upon it, and in the evening the delicate peach-blush of the segments always lures one to the garden for one last look before nightfall. For real garden value, as regards vigor and floriferousness and richness in color, *Dr. Stout* is at the head of the list. It can stand the full sun. Among outstanding colors are *Fred Howard*, a clear ember without trace of fulvous coloring; *Mayor Starzynski*, a delicate bronzy-rose; *Peony Red*; *Rouge Vermillion*; *Corinne Robinson*, light Etruscan, a pastel shade; *Wekiwa*, a velvety red with the habit of *Wau-bun*.

From the standpoint of flower shape, *La Tulipe*, is noteworthy. Although it does not look exactly like a cottage tulip, it is reminiscent of this shape, and at first glance does not remind one of the daylily. The flower is almost upright, somewhat vase-shaped, and the throat is lighted up with clear orange, contrasting with the relatively small portions of the petals that are colored Dark Cardinal. The color is not particularly brilliant, but as in good design, the whole effect is, to say the least, quite pleasing and artistic. The other extreme is represented by such clones as *Theodore Mead* and *Carnival*. In *Theodore Mead*, all the segments are extra long, deep in color, of very excellent spangled texture, curled back and much twisted. In *Carnival*, the segments are recurved with edges slightly ruffled, the very large star-like throat is lighted up with orange-yellow that radiates as conspicuous stripes of the same color through the middle of the petals, contrasting with the small upper portions of the petals that are Moro Red. Here again, the color is not outstanding for brilliancy, but the total effect is that of happy abandon—hence the name. *Indian Chief*, a clear Totem Red, is outstanding for large size of flowers. *John Blaser*, clear apricot, with very narrow segments, and multiflora flowering habit, is a fine cut flower clone.

With reference to future work it should be said that the best is yet to come. After selection of the varied breeding material from the earlier progeny, it is important to utilize it to the fullest extent in breeding still finer clones. In the season 1939, over 25,000 seedlings were produced, and some of these bloomed at 11 months. In 1940, many additional crosses have been made. The clones to be selected from these vast numbers of excellent progeny should approach the ideal that the writer has had before him.

Finally, it should be stated that the writer is an amateur flower grower and breeder and has never sold any plant. All clones introduced have been donated to others, but in some cases plants have been received



Upper, Photo on Nov. 28. An F_1 hybrid of *H. exaltata* (dormant habit) x *H. aurantiaca* Major (evergreen). This hybrid is evergreen with lush foliage and continuous growth. Lower, Photo on April 12. Foliage entirely dead; plant fully dormant during winter. New growth, shown for one plant, appearing above ground from buds submerged during winter. Characteristic for *H. multiflora*, *H. minor*, *H. Dumortierii*, *H. Middendorffii*, and *H. Thunbergii*.

in return, but not on the basis of monetary value. The clones described above can be purchased from plantsmen who advertise in this issue of *Herbertia*.

Mira Flores,
Orlando, Florida,
July 4, 1940

FOLIAGE HABITS OF DAYLILIES

A. B. STOUT,
New York Botanical Garden

The extremes in the habits of growth in the foliage of daylilies, especially as they grow and appear in autumn and winter at New York, may be described and classed as *dormant* and *evergreen*. But there is an intermediate and rather diverse class, some members of which are to be classed as *semi-evergreen* in winter.

THE DORMANT HABIT

The daylilies which have no green leaves for a time during late autumn and winter may be called dormant in habit of growth. For these the period of most vigorous vegetable growth is in spring and early summer when there is the somewhat continuous appearance of new leaves. Then for the late summer and autumn the growth of the buds ceases (is *discontinuous*) or is much decreased (somewhat *sustained*).

In the fully discontinuous growth the last leaves of the season grow to full size or nearly so while much of the foliage still remains green. For some of the daylilies with discontinuous habit (especially *Hemerocallis Middendorffii*, *H. minor*, and *H. exaltata*) the foliage dies early in late summer or early autumn even before there are freezing temperatures. For others (especially *H. Dumortierii*, *H. citrina*, *H. Thunbergii* and *H. multiflora*) much of the foliage may remain green until frosts occur. Usually the youngest leaves are the last to die and some of these may not be of full stature, but the plants of these species are to be classed as dormant in winter and the growth during late summer and autumn is discontinuous or nearly so.

In a more sustained growth, at least some new leaves continue to appear after the spring season of most vigorous growth. But as winter ensues the foliage very fully dies back to the basal buds and then the plants are to be considered dormant. Growth is somewhat sustained for plants of *H. flava* but when late autumn arrives the live buds are almost enclosed by the bases of the dead and dying leaves with the tips of the larger buds protruding slightly above the level of the soil. For *H. Forrestii* the summer foliage dies back into the crown during late autumn and the new growth of the next year comes late in spring from the buds that are rather submerged.

The members of the species *H. fulva* are noticeably diverse in the degree of sustained growth and dormancy. For plants of the clone

Europa the older foliage turns yellow-green and then dies quickly in the period when frosts usually occur, and by November 15th, at New York, the foliage is dead and lax and is lying nearly flat on the ground and the live leaf-buds are short and compact and somewhat enclosed in the base of the dead leaves with the tips almost at the level of the ground. In winter when the dead leaves shrivel and disintegrate the buds become more or less exposed. In the late winter and early spring the buds enlarge noticeably and growth starts early even before the ground is fully thawed. Yet plants of the *Europa* clone are hardy far to the northward. The clones *Maculata*, *Cypriana* and *Rosalind* are quite similar to *Europa* as described above and so are various other plants of *H. fulva*. But the double flowered clones (*Kwanso* and *Flore-Pleno*) and some wild plants of *H. fulva* obtained in China and Japan remain with their younger and partly developed leaves more or less green throughout autumn or even winter.

In addition to the distinct and specific differences in the time when the foliage dies and in the precise character of the dormancy (abruptly discontinuous or sustained), there are marked differences in the texture, color and appearance of the foliage. The dead foliage may become lax and fall flat or it may remain rather erect in a mound; it may shrivel and decay quickly or it may remain tough and wiry; it may become loose and easily separated from the crown or it may remain rather firmly attached throughout the winter. In some daylilies the old leaves break irregularly leaving tufts of fibres which combine to form a somewhat conspicuous mat in the crown. In others the base of the dead leaves becomes thin, papery and brittle.

There are also differences characteristic of species in the position, size and shape of the live buds. During winter the buds may be rather deep in the ground (submerged), or they may be visible at the surface, or they may extend somewhat above the surface. In shape they may be short and compact or quite slender and elongated. When growth starts in spring the young leaves may be spreading or upstanding. Also the old dead leaves may soon spread and fall away leaving the buds exposed or the buds may remain for some time more or less enclosed in the bases of the dead leaves. Various of these characters are common to two or more species. For example, plants of *H. multiflora* and *H. Thunbergii* are very similar in having in autumn tough, wiry, reddish-brown and rather upstanding dead foliage.

Early spring is the time of vigorous vegetative growth in the foliage of daylilies. But there are noticeable differences in the growth of the various species and vigorous early growth and maturity of foliage are not always correlated with early flowering. Of the early-flowering species, *H. Middendorffii* makes vigorous early growth of foliage, *H. Dumortierii* is somewhat slower in the development of foliage and *H. flava* (*Lemon Daylily*) is still later in starting to grow. Also the development of foliage is somewhat similar for the early-flowering *H. Dumortierii*, the summer-flowering *H. Thunbergii* and the autumn-flowering *H. multiflora*.

THE EVERGREEN HABIT IN DAYLILIES

Of the older types of the daylilies (those already known in 1895) as they grow in New York, the clones which were named *H. aurantiaca* and *H. aurantiaca major* have foliage that is continuously evergreen. In these the development of the younger leaves of various sizes continues (see Plate 181) until checked by severe winter weather and although the foliage is more or less frozen and desiccated when spring arrives there is considerable green foliage in sight. It appears that these daylilies have an almost continuous growth combined with the evergreen habit when they are grown in tropical and semi-tropical areas. Numerous of the named horticultural clones now in existence have inherited the evergreen habit from one or both of the two daylilies, *H. aurantiaca* and *H. aurantiaca major*.

THE SEMI-EVERGREEN HABIT

There are wide differences among the large number of hybrid seedlings and named clones in regard to the proportion of leaves that remains green during autumn and winter. Some which have relatively few green leaves in mid-winter may be classed as *semi-evergreen* or *semi-dormant*. It is possible that in semi-tropical areas some of these may have a short period of complete dormancy.

For certain members of the species *H. fulva* a considerable portion of the foliage remains quite green until much frozen during winter. Of these, the *Chengtzu Daylily* appears to be almost evergreen, or at least semi-evergreen, at New York. But Mr. John Watkins has reported by letter to the writer that at Gainesville, Florida, this particular daylily is dormant with all its foliage dead for a "very short rest" while plants of the *Europa* clone have a "long rest." Thus the members of the species *H. fulva* are somewhat diverse in respect to the period of dormancy. In the North some are fully dormant in winter while others are somewhat evergreen.

GROWTH OF SEEDLINGS IN A GREENHOUSE

The seeds for the daylilies grown at the New York Botanical Garden have usually been planted during late summer or early autumn and the seedlings have been kept in a greenhouse during the following winter. As a rule, the seeds of most species and hybrid progenies have germinated promptly; but there have been cases of delayed germination or even of seed-rotting without germination, some of which have been corrected by subjecting seeds to cold temperatures.

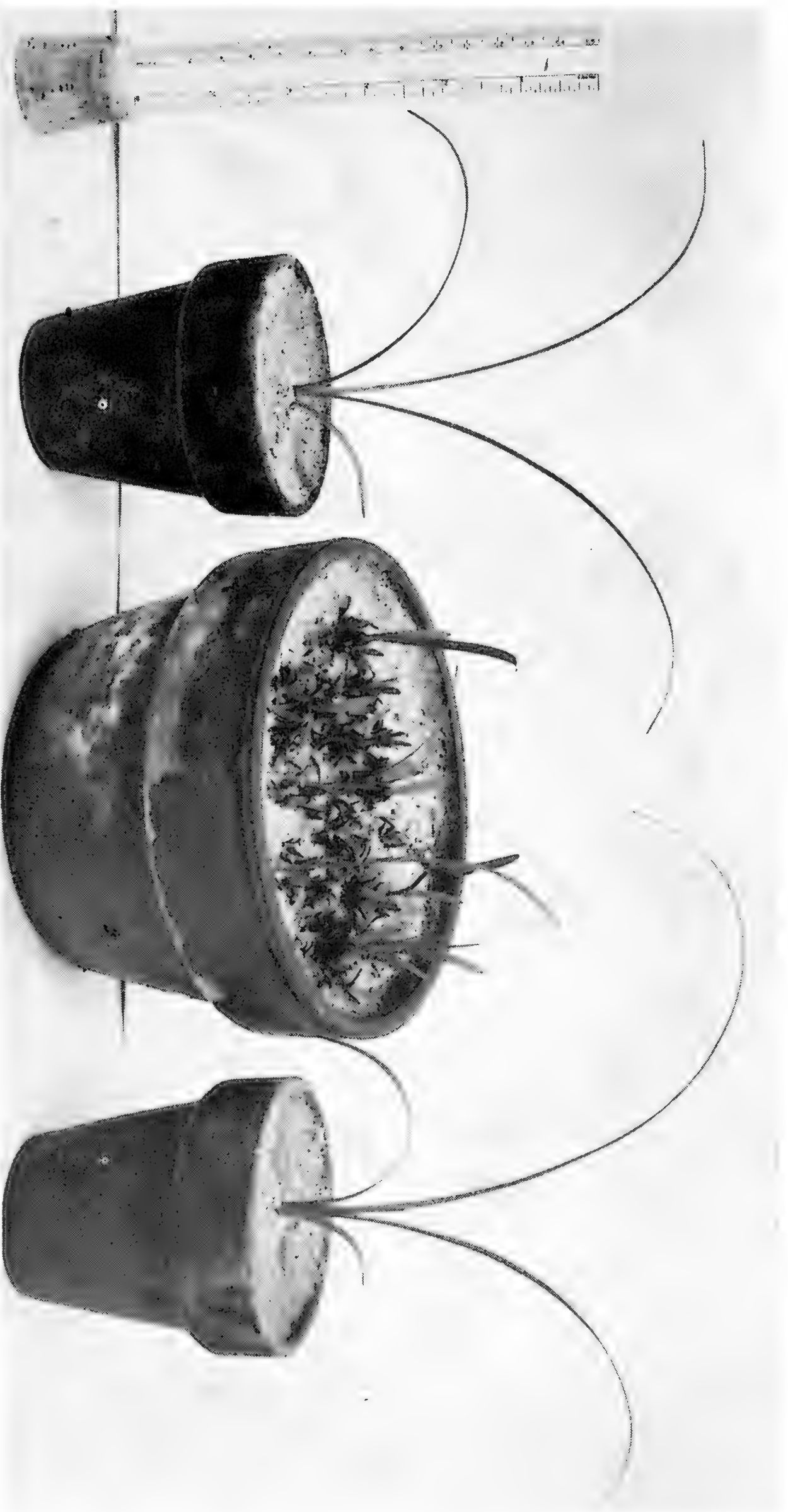
In the growth of seedlings kept in the greenhouse during the entire winter there are the same main types of growth (evergreen, semi-evergreen and dormant) seen in garden cultivation. But for seedlings with the dormant and discontinuous habit there are marked specific differences in the length and nature of the first period of growth, in the length of the period of dormancy that ensues, and in the character of the second period of growth that follows. In the resumption of growth in late

winter or early spring the seedlings which have certain species in their ancestry exhibit a somewhat abnormal type of growth which may be termed *repressed*. This and certain other features of the growth of seedlings may be modified or even entirely changed if seedlings are transferred for a time to a refrigerator or to a cold frame.

The evergreen habit. For seedlings which have the evergreen habit the development of new leaves is somewhat continuous as is the dying of the oldest leaves. There are, however, especially in hybrids of evergreen x dormant combinations, differences according to parentage in the rapidity with which new leaves appear and in the vigor, robustness, and character of the foliage. Usually seedlings with the evergreen habit are so robust that they are placed in the experimental plots during the spring. It has been noted that the continuous growth of seedlings which have the evergreen habit may be somewhat checked by repotting or by transfer during the winter to a cold frame and also to some extent by fluctuations of temperature and perhaps sunlight in a greenhouse. When this occurs there will be some leaves that are shorter than are the leaves at either side in the same fan.

Dormancy in seedlings. In the abruptly discontinuous growth of seedlings in a greenhouse the dormancy of the buds is a conspicuous feature (Fig. 53). Frequently only a few leaves are formed before the growth of the bud becomes discontinuous. In respect to the death of the first crop of leaves two main types of behavior were noted. (a) The leaves may die and the entire plant then has a period of at least several weeks of complete dormancy as far as green foliage is concerned or (b) the last of the first crop of leaves may remain green until the bud resumes growth (Plate 181).

In the resumption of growth during late winter after a period of dormancy, for seedlings growing in a greenhouse, the leaves may become upright and normal or they may become short, usually dark green in color, and rather spreading to form a low flattened fan (*repressed* growth) (Plate 182) which is noticeably different from the growth of the first period. The buds usually become dormant or nearly so. Seedlings of certain species (especially *H. exaltata*, *H. Middendorffii*, *H. Dumortierii*, and a wild type now believed to be *H. esculenta*) very generally have the repressed habit for the second period of their growth when kept in a greenhouse during the entire winter. But if seedlings which have this habit are placed in a refrigerator after they have become fully dormant and left in a temperature slightly above freezing for 30 days the new growth which they then make in the greenhouse is normal. Also the resumed growth is normal if the dormant seedlings are placed in a cold frame during late winter (about March 1st). But with the advance of spring during May and early June, seedlings which have been in the condition of repressed growth and have remained in the greenhouse may change to normal growth, as shown in Plate 182. But various groups of seedlings with repressed growth remained in this condition and some died during the summer while others grew feebly and only made good normal growth after a winter in a cold frame.



F₁ seedlings of **H. Middendorffii** x **H. esculenta**. Seeds were planted early in August. Photo taken May 28th. Germination was prompt but seedlings made few leaves before buds became discontinuous in September. The leaves remained green until January when they died and the plants were fully dormant for about 5 weeks. For plants kept in the greenhouse there was then repressed growth for the few new leaves that appeared. Then the buds became discontinuous, but the plants remained green and resumed normal growth late in May when this photo was taken. The two seedlings in pots were taken, while fully dormant (Feb. 26), to a cold frame; they remained fully dormant until late in April when they made the normal growth here shown.

The seedlings which were left in the pan had a short period of normal vegetative growth, a period of dormancy, a period of repressed growth, and then the resumption of normal growth here shown for the more precocious individuals. The seedlings taken to the cold frame (or to an ice box for a few weeks) resumed normal growth without a period of repressed growth.

It is to be noted that a reduced development, especially in the length of the leaves, is the rule for the very first leaves that appear above ground from any bud, be it the first shoot of a seedling or of a new lateral branch or a bud that resumes growth in an old fan. These first leaves have somewhat the character of bud-scales. But in the repressed growth above described the largest leaves which appear during this particular period of growth are noticeably reduced in development.

Seedlings of species which have somewhat sustained growth in the garden were somewhat irregular in habits of growth in the greenhouse and in some cases such seedlings have been quite fully evergreen. The hybrid progenies of numerous parental combinations of discontinuous x sustained have exhibited considerable diversity in the precise character of the growth.

It is to be noted that the habits of evergreen growth and dormancy and the normal and the repressed habits of growth after dormancy all developed in seedlings that grew side by side during winter in a greenhouse in which the conditions of temperature and moisture favored continuous vegetative growth. Also the changing length of daylight was the same for all the seedlings. The differences in growth are evidently inherent and hereditary.

BEHAVIOR OF PLANTS TRANSFERRED TO A GREENHOUSE

For the evergreen habit. Plants of most of the species and also of various horticultural clones have been dug in the experimental garden at various dates during autumn and winter, planted in pots and placed in a greenhouse. Those daylilies which have evergreen habit and continuous growth grew lustily and more or less continuously. In nearly all cases such plants flowered much earlier than did divisions of the same individual which were grown in the garden. For example, ramets of the *Mikado Daylily* have flowered in March instead of in late June and early July.

For the dormant habit. In November 1939, after the first frosts had occurred but before the ground had frozen, divisions of *H. minor*, *H. Middendorffii*, *H. Dumortierii*, *H. exaltata*, *H. Thunbergii*, *H. citrina*, *H. multiflora*, *H. flava*, *H. Forrestii*, *H. fulva* and of several horticultural clones were transferred to a greenhouse. In every plant of these there was within a few days a resumption of vigorous growth in the formation of new leaves but in respect to flowering and to the later growth there was diverse behavior. In most cases plants of *H. exaltata*, *H. Forrestii* and *H. multiflora* did not flower, and the buds soon became discontinuous and in some cases the plants became almost dormant during spring. *H. minor*, *H. Dumortierii* and *H. flava* bloomed rather soon and although the foliage remained green for a time the buds became discontinuous. Plants of *H. nana* and *H. Forrestii* obtained in autumn from Europe made a limited growth of leaves and flowered, after which they became fully dormant.

Plants of the *Europa Daylily* and most members of the species *H. fulva* made vigorous growth and flowered well during March and

April, after which there was somewhat continuous growth almost as for plants of evergreen habit.

For daylilies with dormant habits (with the exception of *H. fulva*), the plants which were kept in a greenhouse for an entire winter and following spring were in the following May discontinuous in growth and in poor condition in comparison with plants that had remained out of doors in the garden. In May and early June the plants of *H. flava* were almost dormant with the old foliage dead. Plants of *H. Middendorffii* were dormant for a time and the new growth which they made in late May, in the greenhouse, was noticeably repressed. Plants of *H. Dumortierii* remained rather green during May and June but the buds were discontinuous, quite as in late summer for plants grown in the garden. As a rule plants which were dormant grew poorly for some time after they were transferred, about June 1st, to the experimental garden. Some of them died; but others made fair or even good growth of new foliage.

Methods of intensive propagation of daylilies* are most effective at the beginning of periods of vigorous vegetative growth. The daylilies with dormant habits may be divided in early autumn for greenhouse culture but the propagations should be moved to a cold frame during winter as soon as their growth becomes discontinuous.

THE INHERITANCE OF HABIT OF GROWTH

In daylilies the different characteristics of foliage and the various habits in the growth of the buds are hereditary.

The evergreen habit is decidedly dominant over the dormant habit (Plate 181). The data indicate, however, that the clone grown from the type plant which was named *H. aurantiaca* is heterozygous for the evergreen character and is probably itself of hybrid origin. When either *H. minor*, *H. Middendorffii*, *H. multiflora* or *H. Thunbergii* is the other parent in crosses with plants of evergreen habit the F₁ hybrids which are evergreen are less robust and lush than are the hybrids which have either *H. fulva*, *H. flava* or *H. exaltata* as a parent. Also in some of these hybrids and in certain selections of further breeding many seedlings have relatively few green leaves during winter.

The hybrids obtained, both of F₁ and F₂, between species which have an abruptly discontinuous growth and complete dormancy in winter have all had this same type of growth. Selective breeding for doubleness in flowers, in which the more nearly evergreen plants of the *H. fulva* group were parents, have given some offspring decidedly evergreen in character.

The firm wiry texture and rich brown coloring of the dead foliage, as seen in *H. multiflora* and *T. Thunbergii*, is noticeably dominant in hybridization with plants which have other types of foliage.

That various characteristics in the growth of young seedlings in a greenhouse during winter and spring are hereditary is evident. Definite

* Vegetative propagation of daylilies, by A. B. Stout. Jour. N. Y. Bot. Garden 38: 13-17. 1937.



Fig. 54. Photo taken early in February of seedlings three months old from germination. At left, seedling with evergreen and continuous growth; in middle, sister seedling, bud discontinuous, and two of the few leaves still green. These show segregation in sister seedlings. At right, a fully dormant seedling of *H. MIDDENDORFII* parentage. Soil was removed to show dormant bud.

and very contrasted segregation for evergreen and for dormant habits is frequently seen among sister seedlings (figure 54). Normal growth and repressed growth are in sharp contrast. In the more precise features of growth and especially for dormancy, the several species of *Hemerocallis* are all somewhat differentiated, and also many somewhat different minor features of growth develop in the hybrids of the numerous combinations in parentage.

HARDINESS IN DAYLILIES

Several types and degrees of winter injury are to be recognized in daylilies. Foliage that is both evergreen and lush may be killed together with the buds in the crown and then decay with a soft rot in spring. Thus an entire plant may be killed; or some of the growing points, especially on the more submerged branches, may survive but the plant may make a poor showing during the summer. When relatively few fans and buds are killed the plant may recover and even produce a good crop of flowers.

For various plants with dormant habit (both of discontinuous and of sustained growth) the growth in spring of new fans is slow and the leaves and scapes are stunted and poorly developed. Often the largest of the buds are severely injured but the smaller and more undeveloped buds in the crown make quite normal growth later in spring. In many such cases the mixture of injured and normal fans in a plant is in conspicuous contrast during May and early June.

Of the two old clones with evergreen foliage, the *H. aurantiaca* is reasonably hardy through most winters at New York but plants of the true *H. aurantiaca* clone *major* are tender and are often killed during winter unless protected. A considerable number of the hybrids grown at The New York Botanical Garden which are evergreen suffer severely from winter-injury; others are sufficiently hardy to make a good bloom in the summer; others are quite hardy. Numerous seedlings and various horticultural clones have an evergreen or a semi-evergreen habit but when their foliage is tough and rather wiry and the older leaves die without rotting the buds suffer little or no injury during the winter.

There is winter-injury to various of the daylilies which have sustained growth until dormancy ensues or is enforced. Some members of the species *H. fulva*, especially the clones most widely grown (*Europa* and *Maculata*), are fully hardy but others are not. Seedlings grown from selfed-seed of the widely grown *Lemon Daylily* (a clone of *H. flava*) have all been weak in growth and decidedly non-flowering but it is not certain that this is due merely to winter injury.

Plants of *H. nana*, and *H. Forrestii* (which appear to be dormant in growth) have not thrived and some members of these species have failed to live through the winters at New York.

But there are various daylilies, especially among hybrids of certain parentage, which have no green foliage in winter and which are discontinuous in growth that are more or less injured by winter conditions. Of the seedlings that have been eliminated by death during their first winter in the experimental garden, many had an evergreen habit but some had the discontinuous habit. It appears, therefore, that hardiness in the daylilies is not completely correlated with dormancy in growth, nor is tenderness limited to plants with the evergreen habit. Also severe winter injury to the leaf buds is not merely a matter of their exposure, for some of the hardiest of daylilies, as the *Europa Daylily* and *Apricot*, have their live and green buds quite exposed during freezing weather, yet without injury or desiccation.

Under the winter conditions in northern United States hardiness seems to be very general for the daylilies which have discontinuous growth; many hybrids which have semi-evergreen and even evergreen habits are sufficiently hardy for successful culture, especially if their foliage is tough and wiry. Most daylilies with fully evergreen habit and lush foliage are so severely injured that they are of no value for culture in the northern states.

CHROMOSOMES OF CLIVIA CYRTANTHIFLORA

EDITH HENDRIX WITTLAKE, *Ohio*

Clivia cyrtanthiflora is a hybrid between *Clivia nobilis* and *Clivia miniata*. The foliage and flower appear to be quite similar to *Clivia nobilis*. Its flowering time, however, is different from either parent as it blooms during the latter part of July and the first part of August. It sets seed to its own pollen and about fifty percent of these seeds germinate. Although the seedlings appear healthy at first, they gradually decline and die on my hands. I have never raised one more than three

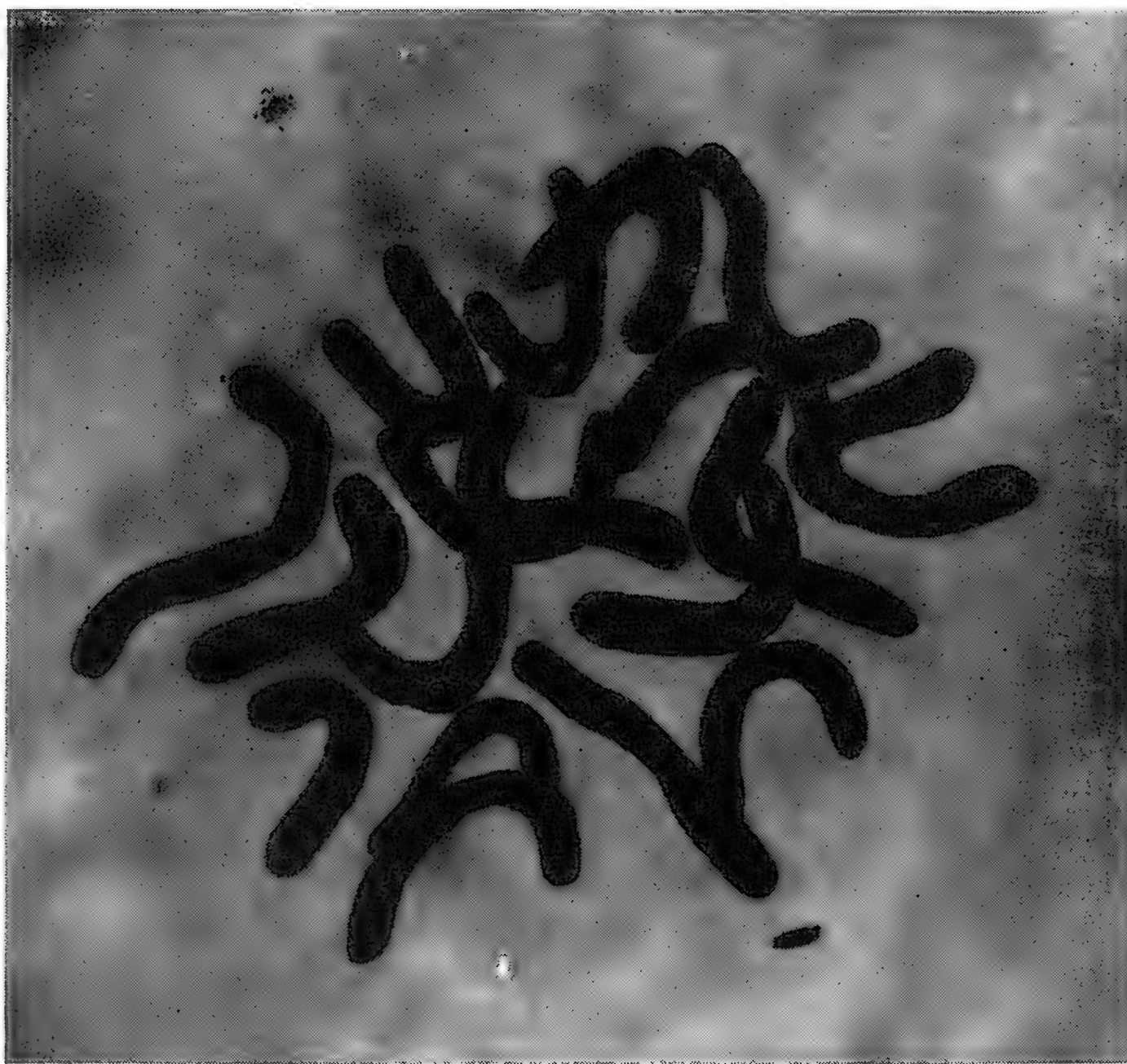


Fig. 55. Photomicrograph showing nine pairs of somatic chromosomes, greatly enlarged, in *Clivia cyrtanthiflora*.
Photo by Eugene B. Wittlake.

months. While this may very well be due to horticultural practices, the lack of success led me to make some slides to determine if possible any chromosome irregularity which might be a factor.

In the autumn of 1939 some root-tips of *Clivia cyrtanthiflora* were taken into the laboratory for this chromosome count. The root-tips were killed in Nawaschin's Solution and run up through a graded alcohol and toluol series into paraffin. They were then sectioned 12 microns thick and stained. In the staining both Haidenhain's Iron Alum-Haematoxylin and Johansen's Safranin and Fast Green were used.

When viewed through a microscope, the cells of the various root-tips showed chromosomes in all stages of development. There were nine pairs or 18 somatic chromosomes in the cells. They all appear quite normal. It seemed necessary to photograph the chromosomes although there was no regular photomicrography equipment available. So an Eastman Kodak Recomar 18 with an F. 4.5 anistigmat lens and a ground-glass back was used to take the pictures through an oil-immersion lens. In photographing the slides, it was found that those stained with Safranin and Fast Green made the best pictures. The accompanying picture (Fig. 55), made from a Safranin and Fast Green slide, shows the nine pairs of somatic chromosomes in the metaphase stage. The chromosomes vary in length from seven to ten microns. Upon making the enlargement, it was discovered that the ends of some of the chromosomes were out of focus due to the fact that they do not lie in the same plane. These ends were retouched on the print with India ink.

The interesting fact about these chromosomes is that they lie well within the range of *Clivia miniata* which varies from 18 to 22 somatic chromosomes, according to the articles in the 1937 *Herbertia* by W. S. Flory and S. H. Yarnell¹. This knowledge ought to interest plant breeders. So far the chromosome count in itself has not answered the question regarding the failure with its seed in the study of *Clivia cyrtanthiflora*, but there is a great deal more cytological work to be done on this plant and with better equipment, now available, this work will be continued.

HABRANTHUS BRACHYANDRUS AND BREEDING POSSIBILITIES

HAMILTON P. TRAUB, *Maryland*

Ever since the brilliant researches of Sealy reinstated the Genus *Habranthus* in 1937, there has been renewed interest in this group of amaryllids. *Habranthus brachyandrus*, (Baker) Sealy, with outstanding flowers of clear pink and deep wine colored throat, has given a very excellent account of itself in Florida over a period of years. The beautiful light pink *Habranthus robustus*, Herb., more widely distributed at present, produces from one to three flower scapes per bulb in early summer, but the flowering season is not long. In contrast, *H. brachyandrus* has a relatively longer flowering season, and a thrifty bulb may produce as many as four to five flower scapes in one season. Bulbs that had flowered in Florida in early summer (1940) were dug in July and replanted outdoors in Maryland in August. Soon after planting these bulbs flowered again profusely. This suggests that this species may lend itself to forcing. It can be very easily propagated from seeds and from offsets that are produced in great numbers.

Crosses made by the writer between *H. brachyandrus* (seed parent) and *H. robustus* (pollen parent) have given progeny mainly similar to the seed parent. This seems to corroborate the results obtained by Dr. Flory and others, but a very small percentage seem to be true crosses

¹ Flory, W. S. and Yarnell, S. H., "A Review of Chromosome Numbers in the Hemerocallideae, Alstroemeriales, and Amaryllidales," *Herbertia*. 4: 163-181, 1937.

since they are intermediate between the two parents. Further attempts should be made, and for this purpose other species of *Habranthus* should also be used in order to secure a wide range of colors, flowering seasons, and growth habits.

Additional species that may be worth considering as breeding material include the following:

- H. Andersonii*, Herb. ex Lindl., (Bright or coppery yellow); Uruguay; Argentine; and Brazil?
- H. texanus* Herb., (Coppery yellow); Texas
- H. gracilifolius*, Herb., (Pale purplish pink); Uruguay
- H. longipes*, (Baker) Sealy; Uruguay
- H. mendocensis*, Herb., (color not recorded); Argentine
- H. pedunculosis*, Herb., (Light red?); Argentine; Uruguay?
- H. sylvaticus*, (Mart. ex Schultes) Herb., (Bright red); Brazil
- H. versicolor*, (Mart. ex Schultes) Herb., (White, flushed outside with red and green); Uruguay; Brazil?
- Amaryllis (Habranthus) caerulea*, Griesb., (Pale blue); Brazil; Uruguay

We are dependent on our Latin American friends in Argentine, Uruguay and Brazil for help in the task of collecting these species for breeding purposes. Any such help would be greatly appreciated by all who are interested in the amaryllids.

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- Flory, W. S. Cytotaxonomic Notes on the Genus *Habranthus*. *Herbertia* 5:151-153. 1938.

PROF. HOOVER ON BRODIAEA AND DICHELOSTEMMA

The members of the Society will be interested to know that Prof. Robert F. Hoover, 165 Santa Rita Ave., Modesto, Calif., has made a scholarly revision of the Genera *Brodiaea* and *Dichelostemma*. His work is so thorough and sound that it will surely find general acceptance. Prof. Hoover is now working on the revision of the Genus *Triteleia*. This important work on the western American Allieae was published in the *American Midland Naturalist*, Notre Dame, Ind., and the *Bulletin of the Torrey Botanical Club*.

—Hamilton P. Traub.

5. PHYSIOLOGY OF REPRODUCTION

GROWING ALSTROEMERIAS FROM SEEDS

W. M. JAMES, *California*

Propagation of most kinds of *Alstroemeria* any other way than by seeds is not very satisfactory. Well developed clumps do not divide without considerable waste and some difficulty, whereas young seedling plants do not need to be divided and can be handled with practically no loss at all.

Most seeds of various kinds of *Alstroemeria* germinate readily under proper conditions. All kinds which I have grown apparently require comparatively low temperature for germination. There are two distinct types of *Alstroemeria* seeds—those that have to be treated before they will germinate and those that do not. *A. aurantiaca* and its forms are the only ones I have had which needed preliminary treatment. The other kinds—*A. chilensis*, *ligtu*, *ligtu* var. *angustifolia*, *pelegrina*, *pelegrina alba*, and *pulchella**—germinate almost one hundred per cent in about thirty days in the open ground in Santa Barbara if they are planted in the fall after night temperatures are 50 degrees F. or below.

Alstroemeria aurantiaca seeds very seldom germinate before two years, and even then only a small percentage, no matter when they are planted. Dr. William Crocker of the Boyce Thompson Institute For Plant Research very kindly consented to run a series of tests to determine whether a treatment could be found which would hasten and improve the germination of the seeds of this type of *Alstroemeria*.

In the fall of 1938 a quantity of seeds were forwarded to Dr. Crocker and in February 1939 I received the following information from Dr. Lela V. Barton; "The seeds of *Alstroemeria aurantiaca* which you sent us have been tested under a number of different conditions. We have obtained 94 to 100 per cent germination after two months at 77 degrees F. followed by one month at 50 degrees F. The germinations occurred at the low temperature. We also obtained 64 per cent germination in a greenhouse at 55 degrees F. after a pre-treatment in moist granulated peat moss of two months at 77 degrees F. plus one month at 50 degrees F. No germinations have been obtained in a greenhouse with a temperature as high as 68 degrees F. You will note that these seeds then require low temperature for germination, but the advantage of a preceding period at high temperatures indicates the presence of a hard seed coat.

From our experiments I would say, then, that if the seeds are planted in a warm greenhouse and left there for two months and then transferred to a cool greenhouse the seedlings will be produced within three or four months after planting the seeds."

* For some time Mr. Harry L. Stinson of Seattle, Washington, has been collecting and translating early writings on **Alstroemeria**. He has found several discrepancies in the nomenclature of those under cultivation. After comparing my plants with the descriptions given in the translations, I agree with him but, will use the present names until his investigations are completed.

A preliminary trial in the fall of 1939 indicated clearly that the method suggested by Dr. Barton can be used to advantage, but some difficulties were encountered. In the first place I have no greenhouse and the only substitute available where a relatively constant temperature of 77 degrees F. could be maintained was a small space near a water heater and storage tank. Not nearly enough room was available to treat the number of seeds desired if they were planted.

Seeds were placed in three loosely covered containers; one with granulated peat moss; another with sand and the other containing nothing but seeds. All were kept slightly moist during the treatment. After thirty days most of the seeds were useless because of fungi and bacteria, even though several methods of disinfection were tried. I am satisfied a way can be found to treat the seeds as suggested by Dr. Barton and will make another attempt in the fall of 1940. Small plants of *Alstroemeria aurantiaca* are needed in large enough quantities to warrant considerable effort in finding a method of controlling pathogens and saprophytes while the seeds are being treated.

NOTE TO THE EDITOR CONCERNING GROWING ALSTROEMERIAS FROM SEED

A planting of seeds of *Alstroemeria aurantiaca* made in soil in a flat placed in a cold frame in August 1938 gave 96 per cent seedling production in May 1939 after a winter in the cold frame protected by a board cover so that the temperature was approximately 35° F. This treatment gave the seed a period of warm weather preceding the cold of winter and may offer a more practical method of producing seedlings in a climate similar to Yonkers, N. Y.

No trouble was experienced with mold in either soil or granulated peat moss plantings of the highly viable seed lot used at Boyce Thompson Institute.

Lela V. Barton.

SHIPMENT OF BULBS IN MOIST CONDITION

L. S. HANNIBAL, *California*

The writer has received shipments on several occasions from the East Coast, especially Florida, of bulbs during their growing state where conditions have made it desirable that the roots be untrimmed. This has applied essentially to evergreen crinums and native Florida species of *Hymenocallis*.

In no case has serious setback in growth been experienced when moist sphagnum moss or damp newspapers were wrapped about the roots—provided that the bulbs were planted at once upon arrival in a suitable planting medium and kept in a cool moist location for several weeks until the roots have reestablished themselves.

This procedure is probably not advisable during the heat of the summer since fungi may grow and the roots may decay thus checking their growth, but during the fall and winter bulbs which have been in

transit up to 7 days have arrived in good shape with foliage in perfect condition, showing no evidence of serious root injury.

The writer's attention was called to an item* recently concerning a shipment of narcissus bulbs that had been sent from coast to coast in a moist condition. In this case the sphagnum moss had been moistened with a glycerine-water solution. The glycerine was said to have prevented evaporation of the moisture and checked fungus growths. This procedure may be of interest to those who occasionally handle such shipments of evergreen bulbs and wish to insure the arrival of their material in the best condition possible.

ATTEMPTS TO GROW LYCORIS FROM SEEDS

C. W. CULPEPPER, *Virginia*

The first experience with *Lycoris* was in 1938 when a few recently acquired bulbs of *L. squamigera* and *L. radiata* flowered. After the flowers faded the writer waited anxiously for the seeds to develop. However, the ovary developed only slightly, that is to less than the size of a garden pea, and then ceased to develop, shriveled and died.

It was thought that natural pollination did not occur and that hand pollination would be necessary. In 1939 all the flowers upon six flowering stalks of *L. squamigera* were carefully pollinated with its own pollen. Pollen from *L. squamigera* was stored in a dessicator for the purpose of using it in pollinating *L. radiata* which flowered a few weeks later. All the flowers on about thirty flowering stalks of *L. radiata* grown in the open were pollinated by hand, twelve of which were pollinated with the pollen of *L. squamigera*. The flowers of six stalks that had been grown in pots were pollinated with their own pollen, and the flowers of five other plants also in pots, in the cold frame, were pollinated with the pollen of *L. squamigera*. All the flowers behaved exactly as the ones in 1938 that had not been hand pollinated. No seeds were obtained and the ovary developed only slightly before shriveling.

In 1940 Dr. Traub suggested that there would be a better chance to obtain seeds if the flowering stalks were cut from the bulb at the time of flowering and allowed to develop with their basal ends in water.* Seven stalks of *L. squamigera* and about thirty of *L. radiata* were pollinated and the basal ends of the stalks placed in water. The flowers of several stalks of *L. radiata* were pollinated with pollen of *L. squamigera*. The material was kept in a warm, well lighted room but not in direct sunlight. In about ten days it was evident that the ovaries were developed to an extent beyond those that were allowed to remain attached to the bulbs. Many of the carpels finally reached one half of an inch or more in diameter. As the basal end of the stalks began to decay they were cut off to healthy tissue and again placed in fresh water. This was

* **Scientific American**, April 1940, p. 223.

* Artificial Reversal of Growth Dominance in Amaryllids. Hamilton P. Traub. Year Book American Amaryllis Society [Herbertia] 2: 109-110. 1935.

continued until only an inch or two of the stalk remained. The carpels with the remaining portion of the attached stalks were then placed in a moderately moist atmosphere and allowed to continue development. However, an examination indicated that the ovules were developing extremely slowly. The carpels were kept alive for approximately three months, yet the seeds after the carpels were finally dry appeared much shriveled and so immature that their viability seemed very doubtful. The seeds were planted but none germinated. It was noted, however, that the ovaries of *L. radiata* pollinated with pollen of *L. squamigera* developed to about the same extent as those pollinated with their own pollen. These experiments indicate that seeds of *Lycoris* are rather hard to obtain in the region of Northern Virginia.

The writer would appreciate obtaining any information about methods of inducing seed development in *Lycoris*. Perhaps someone has been successful in obtaining seeds or has had some experience that may be helpful.

The writer expects to continue the efforts to get seeds and make crosses with different species and it is hoped that others will try to secure viable seeds.

It is hoped that next year the flowering stems can be grown in a nutrient solution perhaps with the addition of hormones. It is also thought that keeping the flowering stems in direct sunlight in a moist atmosphere may be advantageous. The seeds develop so slowly that resort to growing or germinating them in sterile agar may be necessary.

*4435 North Pershing Drive,
Arlington, Virginia.*



W. M. James, Santa Barbara, Calif.

See page 175.

Amaryllis candida



W. M. James, Santa Barbara, Calif.

See page 176

Hymenocallis speciosa

Plate 183b

6. AMARYLLID CULTURE

REGIONAL ADAPTATION, SOILS, FERTILIZATION, IRRIGATION,
USE IN LANDSCAPE, DISEASE AND INSECT CONTROL, ETC.

AMARYLLIS CANDIDA, HYMENOCALLIS SPECIOSA, ISMENE
AMANCAES, PHAEDRANASSA CARMOLI AND
BOMAREA ACUTIFOLIA

W. M. JAMES, *California*

Each season we are pleasantly surprised when various amaryllids under trial come into flower. This season the five briefly described below are outstanding.

AMARYLLIS CANDIDA

Nowadays, even though we receive many unfamiliar plants, inquiry soon reveals that most of them were discovered and named many years ago. So, when a plant which was discovered and named very recently is received, it bears additional interest. Several bulbs of *Amaryllis candida* were received from Argentina by the Las Positas Nursery late in the summer of 1939. These were not planted until late the following winter, which would be the normal time for them to start growth in their native habitat. One plant bloomed in May.

It is a really striking flower. (Complete description in *Herbertia* Vol. 5 1938, page 123.) A stem about three feet tall had five pure white flowers, larger, but shaped very much like *Lilium formosanum* (Pl. 183a) and with the distinctive fragrance of *Lilium sulphureum*. On the single plant which flowered, the leaves started soon after the flowering stalk, but did not reach full development until after the blooming period. Apparently we were especially fortunate in having this plant bloom, as *Amaryllis candida* generally does not do so for two years after being dug, even when the natives move it directly into their yards from its natural habitat.

The leaves are very different from those of the other *Amaryllis* species. There are seven to eleven growing almost upright and they have a peculiar, gray-green color. The shape also is different from those of the large-flowered hybrids we are so familiar with.

Amaryllis candida is found in Tucuman Province and grows in a sandy soil where there is a dry atmosphere and scanty rainfall. It is not very hardy and suffers occasionally from ten degrees of frost in its native habitat. Most of the bulbs were growing nicely when this was written in June. Presumably they should be kept dry during the winter, and that will present difficulties out of doors in Southern California, especially when they do not bloom for two years after being moved. Needless to say, some time will be needed to determine the full cultural requirements, methods of propagation and uses of this splendid plant.

HYMENOCALLIS SPECIOSA

One seed of *Hymenocallis speciosa*, which I had received from Mr. Wyndham Hayward a few days before, was planted on September 29th, 1936. The first flower opened October 13th, 1940 and the plant was photographed on the same day (Plate 183b). Six days later eight of the nine buds were open and the first flower was still good. The cluster of bright, pure white flowers make a really beautiful sight.

Because *Hymenocallis speciosa* is a West Indian species, I inveigled a friend, Mr. Percy Ellings, to grow this one seed under "glass" in his care. We hope to get seeds from these flowers and if we do will feel like trying it out of doors.

ISMENE AMANCAES

This is a beautiful plant from the Hill of Amancaes near Lima, Peru. There are four or five green, partially erect leaves one and one-half to two inches broad and eighteen inches long. The green flower stem is slightly flattened (ancipitous) and about eighteen inches tall. Baker says that the umbel is three to six flowered, but the one pictured had seven. The flowers (Plate 184) are mostly horizontal, nearly sessile and have a greenish perianth tube three inches long; segments one-fourth to three-eighths inch wide and two to two and one-half inches long; the bright yellow staminal cup is obconical, two inches in diameter at the throat and has six green vertical strips. It blooms in Santa Barbara in June, and apparently it prefers a well-drained sandy loam. It will not stand much cold and should be kept dry while dormant. (In the coastal districts of Peru it hardly ever rains very much. The moisture is mostly from drizzles, heavy dews and mists.) It does not seem to mind being dug in the fall and kept in storage until time for growth to start in late winter.

Even though it was flowered at Kew in 1878, it is still very scarce. My short experience indicates that it will thrive if the cultural precautions outlined are observed.

PHAEDRANASSA CARMOLI

Bulbs of *Phaedranassa Carmoli* were received from Zarcero, Costa Rica in the early summer of 1939. They were planted at once and started leaf growth which lasted until late fall. The first flower appeared in late winter (Plate 185) and, as the bulbs did not all bloom at the same time, there was a succession of bloom until early summer. The new foliage did not start until late spring. Apparently it likes partial shade and plenty of moisture during the growing season. Probably it can be grown out of doors in the mildest climate only. Like any new plant, it will take observation for several seasons to learn its habits and uses.

The flowers are bright red tipped with green and are borne in an umbel of ten to twelve on an eighteen inch stem. They are attractive and last about a week when cut. The leaves are lance-shaped and bright green in color; about three inches broad in the middle and twelve to



W. M. James, Santa Barbara, Calif.

See page 176

Ismene amancaes



W. M. James, Santa Barbara, Calif.

See page 176

Phaedranassa Carmioli

Plate 185



W. M. James, Santa Barbara, Calif.

See page 180

Bomarea acutifolia

fourteen inches long; and grow mostly after the flowering season. *Phaedranassa Carmioli* gives promise of being a useful member of a little known group.



W. M. James, Santa Barbara, Calif.

Fig. 56. Fruit of *Bomarea acutifolia*

BOMAREA ACUTIFOLIA

Dormant plants of *Bomarea acutifolia* were received from Zarcero, Costa Rica in the early summer of 1939. They were planted at once and remained dormant until late fall, flowering the following spring. Probably several seasons will be necessary to learn the habits and to determine the full cultural requirements of this plant, especially as there are few bomareas in cultivation and little is known about their culture. Apparently it likes best to twine upwards and outwards so that the flowers can be produced in more or less direct sunlight. It is doubtful if it can be grown out of doors except in the milder climate.

The blossoms (Plate 186) are tubular with a slight flare at the top and are borne in an umbel of six to eight. The color is bright scarlet outside and deep golden yellow inside. The general appearance becomes more yellow as the flowers age. There are six stamens with bright blue anthers borne inside the flower. The green leaves are borne throughout the length of the stem. The stems are tough and wiry and twine tightly around each other or any support available. The flowers are long-lived, either on the plant or when cut. The fruit is illustrated in Fig. 56. One season's observation indicates that *Bomarea acutifolia* will be a colorful and useful new addition to our group of bulbous plants.

CRINUMS AND OTHER AMARYLLIDS IN NORTH CAROLINA

ELIZABETH LAWRENCE, *North Carolina*

I think that last winter was the final test of the crinums in my garden. While the thermometer did not drop below six degrees above (it went to zero in 1917), the month of January was the coldest on record, and two late freezes were more damaging than the severe weather earlier in the year.

Since I began collecting crinums, nearly ten years ago, I have had fifteen kinds, nine of which are perfectly hardy and bloom without fail. One, *C. americanum*, seems to be hardy but has never bloomed. I wonder if this is because the buds are formed too early, and are nipped by the frost. This is what happened to *Cyrtanthus parviflorus* this year. The rest of the fifteen may live through the winter, but they do not recover sufficiently to bloom the following season. They gradually disappear. *C. Kirkii* and *C. Kunthianum*, the last to be added to the nine hardy ones, not only survived the rigors of last winter, but are already pushing up their stout flower buds.

Among the species that have proved garden worthy are four of the Milk-and-Wine Lily type, *C. Kirkii*, *C. Kunthianum*, *C. erubescens*, and one that is unidentified. The flowers of the first two species are large, and in many-flowered umbels on stout, short scapes a little over two feet in length. They bloom in June and July, and may repeat in the fall. The flowers of *C. erubescens* are smaller and drooping and not so wide open. The scapes are nearly three feet. It blooms late in June and early in July. The unidentified Milk-and-Wine Lily blooms from early August almost continuously until frost. I have had flowers from it in November. This makes the crinum season, beginning with *C. longifolium* in April, a long one. The Milk-and-Wine Lily is the only fall-blooming crinum that I know. It is also one of the most beautiful, with five or six red-keeled, milk-white flowers opening very wide on long tapering scapes. The leaves are a peculiar yellow-green which distinguishes them from the foliage of any other species. This crinum is found in old gardens, and is in the trade as *C. fimbriatulum* (which Mr. Hayward says it is not). At Mr. Hayward's suggestion I sent one of the enormous bulbs to Mr. Sealy at Kew, and he has promised to identify it when it blooms.

C. longifolium is the hardiest crinum, and the least attractive. I have a white form and a pink one. Both are very homely. The only reason for having the white is that it is the first crinum to bloom. There is no reason for having the pink, except that it is an undertaking to dig it up.

C. Moorei is very different from any of the crinums that I have had except *C. giganteum*. I have reluctantly given up *C. giganteum* as unfit for gardens in North Carolina. I think it is almost the loveliest flower I ever saw. The flat dark foliage rosettes are decorative in themselves. I have had this species twice, but it bloomed only when it was not put into the ground until warm weather. It is pure white. The

very similar, but pale rose flowers of *C. Moorei* have the same vanilla fragrance. There are six of them to the short slender scape. This species blooms only once with me, usually in August. It requires shade.

In addition to these species, two hybrids, *Powellii* and *Cecil Houdyshel* (both results from crosses between *C. longifolium* and *C. Moorei*) are satisfactory in the garden. There are white and pink forms of *Powellii*. The white form has improved every year until there were so many scapes on it last spring that I lost count after the tenth. I am sure that there were at least fifteen during the month of June. Five of them were in bloom at once. The pink form, the best pink that I have had, did not persist. The clone *Cecil Houdyshel* turned out to be rather pale in my soil, but a very good bloomer, producing scapes in June, July and August.

Another unidentified crinum is one of the loveliest. It came to Miss Isabel Busbee from the Royal Palm Nurseries by mistake for *C. erubescens*. I sent a flower scape to the Royal Palm Nurseries and it was pronounced *C. longifolium*. If it is a form of that very variable species, it is by far the best I have ever seen. It is on a different scale from other crinums, being smaller and more delicately made as to leaf and flower. There are four or five flowers on the slender tapering scape. They are faintly flushed with pink, and delightfully fragrant. This is one of the best bloomers, producing flowers every month from June through September.

The crinums that have not been successful with me are *C. giganteum*, *C. scabrum*, *C. amabile*, a species from Burma, and the clone *Empress of India*. All except the one from Burma bloomed the first season after being set out late in the spring. All came back the following spring, but did not bloom. This is the third year, and none of them are showing above the ground yet. After last winter I doubt if they will. I have also had a crinum that came from the five and ten, and that I took to be *C. asiaticum*. It bloomed the first year, but did not persist.

Crinums are said to be heavy eaters and drinkers. However, they could not do better than in my garden where they are seldom watered or fertilized. They seem to thrive in heavy clay, and do not object to afternoon shade. *C. longifolium* blooms cheerfully in full shade, and *Powellii* blooms well but not so well as in the open. Crinums increase rapidly, but it is a shame to divide them for the bloom is so much better if they are left undisturbed.

I have been much interested to see how well the Amaryllids that make winter foliage have gone through this last severe winter. The bright green leaves of *Callicore rosea*, usually cut back early in the fall, have scarcely been marred, and have been more numerous than ever before. I wonder if this beautiful Amaryllid, perfectly hardy here but accustomed to sulking, will surprise me by blooming this summer. *Amaryllis advena* kept its green and glossy leaves until spring. The pale green tender looking foliage of *Lycoris squamigera* remained as fresh as usual. The leaves of *Lycoris aurea* (which never blooms) and those of *Nerine undulata* (the only nerine that has ever bloomed for me) have also gone throughout the cold unharmed.



W. E. Rice, Downey, Calif.

See page 185

Sprekelia formosissima

Plate 187



W. E. Rice, Downey, Calif.

See page 185

Chlidanthus fragrans

SPREKELIA AND CHLIDANTHUS

W. E. RICE, *California*

Two of the most beautiful members of our Family of amaryllids, to me are *Sprekelia formosissima* and *Chlidanthus fragrans*, and both are native to our own hemisphere. *Sprekelia formosissima* with its native habitat south of Mexico City, looks like a big blood red orchid (Plate 187). We find when this bulb is planted fairly deep, six inches or more, though not much more, and in sandy silt or light loam with good drainage, it is not at all hard to grow, if given an abundance of water all the time the foliage is good and green. In a very mild climate it will stay green all the time. If left undisturbed for a few years you will find very satisfactory increase and *Sprekelia* also grows very readily from seeds, but to secure a good heavy crop of seeds the flowers should be hand pollinated. For an old timer and indeed an old favorite, it is quite remarkable that *Sprekelia* is not more freely grown. It should be in everybody's collection, sometimes it is spoken of as Aztec Lily, St. James Lily, or Jacobean Lily. Like most amaryllids *Sprekelia* and *Chlidanthus fragrans* both like ground that is very rich for they are gross feeders.

Chlidanthus fragrans comes from South America, somewhere in the Andes. The writer has a very fine collection of this species and we get more joy from them than the others. With him they do exceedingly well. The bulbs do not grow so very large and a ten centimeter bulb will give very good bloom—such flowers (Plate 188); beautiful clear Canary Yellow with long tubes, in umbels anywhere from three to six on a stem and with a very pleasing fragrance makes them most desirable.

Without doubt *Chlidanthus fragrans* is one of the jewels of the Family that have not yet been generally discovered. When it does come into its own, the writer predicts it will in a year or two, then it will be everybody's sweetheart. They also grow easily from seed which is freely produced and they are not at all stingy about multiplying by offsets. It makes a splendid pot plant, but when soil is not allowed to dry out.

HYMENOCALLIS FLORIDANA IN THE GREENHOUSE

EDITH HENDRIX WITTLAKE, *Ohio*

In 1934 Dr. Glenn Blaydes of the Botany Department at Ohio State University collected a small clump of *Hymenocallis Floridana* while on a trip to Florida. Upon their arrival in Ohio the bulbs were potted in rich heavy soil and the large 12-inch pot was partially submerged in one of the tanks of the Tropical Room in the Botany Greenhouse. Since 1934 the bulbs have not been repotted or disturbed in any way.

This clump of *Hymenocallis* has bloomed regularly three times a year until this year when an experiment was made. *Hymenocallis floridana* sets seed freely when hand-pollinated, but often sets seed without this aid. The large, green seeds are very slow to germinate. If the seeds are kept continually moist, germination may occur in five or six

months. They are easily germinated in a jar of water and then transferred to muck. The scum which may collect around the sides of the jar does not seem to hurt the seeds. These seeds may also be kept in a dry condition for a month or so and then put into water or muck. The seeds shrivel slightly under this latter treatment but will recover if not stored too long. Seeds stored longer than two months probably will not germinate. Seedlings require the same conditions as the mature plants and apparently will not flower until several years old. Two-year old seedlings show no signs of flowering as yet.

The flowers of *Hymenocallis Floridana* are quite large and very fragrant. They make good cut-flowers and last almost a week if not pollinated. A pot of these bulbs in flower never fails to attract the attention of all who enter the greenhouse.

Until the autumn of 1939 the bulbs of *Hymenocallis Floridana* had two flowers to a single scape. In August of 1939, since the bulbs had never been repotted, I stirred in among them about a potful (2-inch pot) of "Vigoro". The bulbs were nearly dormant when this fertilizing was done and the foliage had all died down. In November the bulbs bloomed again, and the flowers were magnificent. All of the scapes had three or four flowers. Not a single scape had only two. Of the scape shown in the photograph (Plate 189) two flowers were hand-pollinated. Three large and two small seeds were harvested from each one as well as many abortive seeds.

Ordinarily these bulbs would have bloomed again in March of this year. This blooming season produced no flowers, but a large number of new shoots. Now in June one bulb has sent up a flower scape, but it is still too small to determine the size and number of flowers.

THE BLUE-FLOWERING AMARYLLIS, AMARYLLIS PROCERA

HARRY BLOSSFELD, *Sao Paulo, Brazil*

[I am enclosing herewith an article about *Amaryllis procera*, a plant that I collected in 1938 and 1939 in Brazil. When visiting my friend, Sr. Joao Dierberger of Sao Paulo, he gave me a copy of the review, *Herbertia*, in which I found an article about *Amaryllis procera*, and was astonished to find there many incorrect statements about its native locality and growing conditions, that apparently were written by those who never in their lives collected a single *Amaryllis procera* in person.

The statement, for instance, that the soil in which these plants grow is about two feet deep on the rock base, is rather exaggerated. I found many plants growing in a soil layer of about one inch, and never collected a plant from a place where the soil layer on the rock base was deeper than ten inches. Also the statement about the effect of charcoal on the acidity of the soil is ridiculous because in Brazil it is a custom to burn the grasslands every year but on the area where these plants grow there is no grass to burn. The only additional vegetation consists of mosses, algae, lichens, and here and there plants of *Vellozia* and



Eugene B. Wittlake, Columbus, Ohio.

See page 186

Hymenocallis Floridana

Bromeliaceae. The humidity of the air is high in the morning and evening, and much dew can be observed on the leaves of *Amaryllis procera*. The statement that the dew will drop from the trees in the morning at the spot is also exaggerated for any dew that might drop can have no influence on the *Amaryllis* plants for there are no trees. But the presence of thick fog mornings and evenings is important for this fog produces the numerous springs on the upper part of the rock that supply the *Amaryllis* with an abundance of water even during the driest season of the year, and on the hottest days. —*Excerpts from a letter written by Sr. Harry Blossfeld at Piura, Perú, Nov. 11, 1940 and sent from Casilla 2640, Lima, Perú. Sr. Blossfeld further informs us that he is on a plant collecting trip in northern Perú, and Ecuador. Next year he will continue his plant collecting in Colombia.*]

When studying botanical literature several years ago, I discovered a note on *Amaryllis procera*, which was reported to have blue flowers. This short scientific remark interested me so much, that I traced the matter and made a record of all material found in literature in my notebook, where since finishing my practical horticultural activities I am accustomed to collect all available data on rare plants of horticultural value.

The country of origin of this curious plant was said to be central Brazil, where it was reported to grow in full sun; making very large and bottle-shaped bulbs with long necks and the leaves curved like scimitars. The plants had been introduced into France some thirty years ago, but they have disappeared from culture.

Several years passed after I recorded these data and I experienced many adventures in the mean time, when I traveled twelve thousand miles through South America as a plant collector. It was not until 1937 when I remembered this interesting plant and made inquiries on it during a collecting trip through the Organ Mountains in Central Brazil. I got some hints as to where this *Amaryllis* might be found, but I could not get any good material at that time. Half a dozen small bulbs were brought to me by one of my orchid collectors, who however had received them himself from another source but he knew more or less where the plants were growing.

When on a collecting trip in the Organ Mountains again this past year, I made new inquiries and finally succeeded in finding the exact spot where the plant was reported to grow. Many people warned me not to make the trip to collect them, as the rewards would be very low and the expensive costs of the trip would be wasted money. The plants were reported to grow on abrupt rock slopes, and only where men can not reach them they were said to grow in some quantity. But I had failed at that time to get certain orchid plants, the collection of which had been the main purpose of my trip, so I had already wasted the money for the expedition and not being willing to return with a complete failure, I decided to risk some more money in order to bring home some fine material.

With one companion I started from a small village by truck, with only a small suitcase, containing some food, clothes and a few bags

which we hoped to fill with the *Amaryllis* bulbs or with any other valuable plant material, should we fail to discover the first. When the road ended at a "fazenda" (large farm), we walked on for a few hours in a beautiful valley on a narrow, rocky road, which was a painful matter owing to the tropical heat and the lack of water. Climbing up the mountains at last we found a clear brook where we rested, and nearby we found some people of whom we inquired about the *Amaryllis* plant. We were so happy to get exact information, and they showed us a large, bell-shaped rock, nearly bare of any vegetation, and some thousand feet high, on the flanks of which we discovered with the field-glass greenish specks, which we were assured were clusters of our blue flowering *Amaryllis*. We were so hopeful at that view, that we arose immediately from our rest, and contracted the two men we had met to help us. We had noticed, that the rock would be difficult to climb, and we realized that we needed help to bring down the collected material.

We felt some misgivings when contracting these two men who looked like tramps. But there was no choice, we needed the help badly and trusted on our good luck and last but not least on our pistols. We had these loaded with shot, as this is the best protection against poisonous snakes, which are abundant in this rocky region, but when the night came, I changed the third and fourth shot cartridge of my pistol magazine for bullet cartridges to be prepared for all eventualities.

Before it became dark, we arrived at the foot of the rock and after selecting a good resting place with water nearby, we climbed the mountain to explore, only taking with us our Cine-Kodak and a photographic camera. The rock became abrupt only in its upper parts, where its form was, as mentioned above, like a bell and nearly bare of vegetation except for some low alpine plants and dwarf shrubs. The lower parts were heavily inclined but not directly abrupt, and there was also dense vegetation of shrubs. We found there some terrestrial *Oncidium* and *Laelia* orchids; higher up on the rocks, very decorative large *Bromelia* specimens, in the water-filled center of which a beautiful blue-flowering *Utricularia* was abundant. The latter is interesting because it traps microbes in the water with its roots. There were also two fine species of *Vellozia* with blue flowers, born in quantity around the globular crown of these dwarf shrubs. These are similar in shape to Japanese dwarf trees and are undoubtedly of decorative value.

When climbing upwards, we arrived at the rocky top part of the mountain and there we found on the bare stone crowded in large clusters the *Amaryllis procera* we sought. Their two to three feet high necks all pointed northwards, right into the sun at noon. The rocks on which they grow, are all inclined in the same direction. The strangely curved leaves were swinging in the hot wind of the evening and each had a fine purple line on the margin. They were of a greyish green and leathery, and quite succulent. We stood a while around the first cluster which we found before we considered the best way to gather them, and how to carry them down. This was by no means easy, because the clusters of bulbs generally grow on bare, heavily inclined, rounded rocks, which were difficult to reach and harder to climb. Should

the collector slip on his way to reach them, there would be little chance to stop the fall. Slipping was difficult to avoid, as all these rocks were moistened by dropping water and overgrown by algae and lichens. The black soil of leaf mould in which the *Amaryllis* bulbs grow was quite swampy, but not "sour,"* as water continually washed through it. Although it was near sunset when we set out on our return, the wind blew hot and the rocks were quite warm. That gave us an idea of how this spot would be the next day at noon, when the full tropical sun would burn on the slopes.

We arrived at our camp without accident, prepared our meals and whilst our two men laid down to sleep, we had still to discuss the best way of collecting our bulbs in as short time as possible. We had brought with us food only for two days, but there were now four hungry men instead of two, so that we had to finish the job in one day. When we had discussed everything and prepared our plan for the next day, it was midnight and we laid down on our bed of grass, which we had cut before it became dark.

But we could not sleep, perhaps because of the excitement of our success or due to our weariness after five hours of walking and climbing in tropical heat. Besides, there was another obstacle. There were ticks round us in the grass and on the shrubs in such quantities, that we felt them stinging all over the body. We got up and tried picking them off but half an hour later we again had as many as before. We did not sleep a single minute during that night and at three o'clock we went to the fire and prepared ourselves some coffee and drank many cups, hot, black and bitter. After eating some "rusk" we lighted our pipes and awaited the dawn.

Our two men had slept well all the night over, they apparently were accustomed to ticks and did not suffer from their bites. When still grey fog flew through the valley and the first faint glow of the morning appeared, we climbed up to the *Amaryllis* bulbs and when the sun raised over the mountains on the opposite side of the valley, our men had already brought down to the road several bags of these plants. My companion and I selected the best bulbs from the clusters, collected and cleaned them carefully and put them into the bags. Our men carried these down when they were filled.

In the cool morning we wore light shoes with felt soles, such as alpinists wear when climbing in the rocks. They allowed us to go quickly and safely over the most dangerous spots, but when the sun raised higher and it became warmer, we feared the poisonous snakes, which are always dangerous on hot days and we changed our shoes for high hunting boots of thick leather. Had the collecting work been difficult before, it became now dangerous as we constantly slipped. The final result was, that we had to use our bare hands when climbing over the slopes. I doubt whether we would have been able to kill a poisonous snake during most of the time without slipping down the rocks, for the heavy boots proved to be most unpractical. Fortunately no accident

* The exact meaning of the word "sour" is not clear. Sr. Blossfeld will undoubtedly explain its meaning in a further communication. —Ed.

happened, although several times we observed snakes taking their sun bath on the bare, hot stones.

At three in the afternoon we had already gathered most of the quantity of bulbs we needed, but the heat had become so oppressive at that hour, that we had to take a rest. Each of us loaded a bag containing 10 to 15 bulbs on his shoulders and we climbed down. We arrived at our resting place completely exhausted, which can be explained only by the heat, the lack of sleep during the past night, the abruptness of the mountain and the heavy weight of the load we carried, for each bulb weighs from 2 to 5 lbs.

After an hour's rest and a good meal, we climbed up again, carrying once more with us our photographic material. We wished to take some pictures and also a hundred feet of film from our spot before the daylight disappeared. On the way we discovered that on the most difficult places, where it was nearly impossible to find access, the *Amaryllis* bulbs were growing in quite large quantities, whilst on easier spots the clusters were scattered only sparsely. When we arrived at a place, where we could stay firmly and rest a moment, we inspected the flanks of the surrounding mountains with the field-glass. We could not discover one single *Amaryllis procera* anywhere else and I believe, that this plant grows only on the northern slopes of the Organ Mountains and even there occurs only sporadically at places which are distant one from the other, or it may even be, that it grows only on the place where we collected it. This also explains, why this fine plant has been so rarely cultivated.

We had the intention of reaching the very top of the mountain in order to have a glance on the other side of it. Climbing upwards, I arrived under a rock table and when raising my head over its top, I had such a surprising view, that I nearly lost my balance and fell back on my companion's shoulders, who was nearby below my feet. I had discovered a large cluster of *Amaryllis procera* bulbs and in the center of it one bulb bore a stem with four beautiful blue flowers! The sun was shining just from one side through the large and decorative blooms, thus showing every fine detail of the nerves and veins of the petals. Each blossom was three to five inches in diameter, the color being a bright heaven-blue with darker veins. The borders of the petals were undulated and rippled, and their tops pointed slightly backwards. The bunch of flowers was on a 15 to 20 inches tall stem. Some time later, we also discovered a few seeds inside a rounded pod, which had three chambers, each of which contained two rows of black, flat seeds. A few seeds had already fallen out of the pod on the swampy wet soil between the bulbs, and a few of them had just germinated.

After taking a good many pictures it had become late, and we climbed to the top of the mountain, which proved not to be as easy as we thought it would be. A 20 feet high vertical rock wall, crowning the mountain top, proved to be very difficult to climb and as its top showed dense jungle vegetation, we did not expect to find any interesting plant material there. We therefore explored this small top part of the mountain. We returned and quickly collected the remaining bulbs

to complete the lot we needed and just when the sun disappeared below the mountain's top we had the work finished. All of the output was brought to our camp, where a mule caravan had arrived which carried the bulbs to the road, where our truck was waiting. It was already midnight, when we had loaded the bulbs on the car and could start back to civilization.

I have now a good many of these bulbs planted in my nursery in the open at Sao Paulo, Caixa Postal 2189. I did not lose a single plant of the lot I collected and all of them are in splendid condition and growing vigorously, in spite of the very different climatic conditions of Sao Paulo, which has a sub-tropical climate, whilst the habitat is in the tropics though in altitudes of 3000 feet above sea level and higher. This proves, that blue-flowering *Amaryllis* is not so difficult in culture as reported in the literature. The plants need full sun, intermediate house temperature and must be planted in a rich leaf-mould which should be mixed with some loam to avoid drying out. The soil must be continually moist and in summer, when the plants are in full growth, it can be kept quite swampy, but the soil must not be "sour" as this causes rotting of the bulbs. On the other side, a basic condition of the soil, in consequence of existence of too much lime is harmful to the bulbs also.

Propagation of *Amaryllis procera* can be effected by offsets, which are regularly produced under suitable conditions, and propagation by seeds is another suitable way, especially in warm climates, where the seedlings can be kept in the open all the year round.

The blue colour of the flower makes this plant specially valuable for hybridizing purposes and I can imagine, that crossings with large flowered *Amaryllis* hybrids of white colour would give results of fantastic beauty and outstanding shape and form of flowers. But the true species itself is very useful because of its novelty colour and because of its excellent keeping qualities, both on the plant and as a cut flower.

THE BLUE AMARYLLIS, AMARYLLIS PROCERA, IN FLORIDA

E. J. ANDERSON, *Palm Beach, Florida*

My experience in the culture of *Amaryllis* has been relatively short and I feel that I was indeed fortunate in having one of my *Amaryllis procera* bulbs bloom this past spring (Plate 190). Before importing my bulbs I read many interesting articles on the suggested culture in issues of *Herbertia*. I then felt that I would like to do a little experimenting and therefore imported a dozen bulbs. These were not as large as those described in *Herbertia*. However, they were healthy stock and soon developed long sickle-shaped leaves; and in many instances made active root growth.

In planting I considered all of the suggested methods of culture and arrived at the conclusion that I would plant each bulb differently. The growing medium ranged from good, sandy loam to osmunda fiber. The differences in the soil consisted of additions of leaf mold, muck and sandy loam in various proportions. From my observations they enjoy



Amaranthus procumbens photo by E. J. Anderson

semi-terrestrial culture as those bulbs planted in approximately one-half fiber and one-half soil seemed to develop the best root systems.

In making the experiments I have subjected the bulbs to about every condition possible in this locality and believe that water control is necessary. I also found that partial shade was beneficial. Several of my bulbs, though small, seem to be growing nicely and I have every hope of securing flowers this spring.

I have recently been advised by a South American exporter that *Amaryllis procera* is kept growing throughout the year in Brazil—never allowing a rest period. I find this true as the foliage is green this 18th day of October and shows no sign of resting.

I intend to experiment with different amounts of shading—that is, shading the base of the bulb and allowing various degrees of sunshine on the foliage. My reason for this experiment is based on the fact that in its native habitat it grows in tall weeds or bushes and the tops only are exposed to the elements.

ALSTROEMERIAS: A NEGLECTED OPPORTUNITY

J. C. TH. UPHOF, *Orlando, Florida*

Alstroemerias deserve more attention than they have received in the past. The plants are far too attractive to be ignored. The various species have very ornamental flowers and are of great promise to the plant breeder. Occasionally we encounter a very few in a garden or park; some species are always present in a botanical garden. Many years ago their beauty was much more appreciated than at the present. Later their improvement had to give way to that of a number of other species like gladiolus, dahlias, amaryllis, begonias, sweet peas, petunias and others from which an endless chain of fine hybrids and varieties originated. This should also have been done with *Alstroemeria*. The flowers are easy to handle during the process of hybridization and there is much variety among the many species available. Combined with our knowledge of plant breeding and of genetics, we are more or less able to predict the beautiful hybrids we may be able to obtain after some years of effort. As stated above only a few species are found in gardens but when we consider the large number of species for example in the Herbarium of the Royal Botanical Gardens at Kew and of Berlin-Dahlem which I had the privilege to examine, then we conclude that there is something in this plant genus for the horticulturist to develop. In this connection I wish to give a short botanical and horticultural account of this group.

Nearly 60 species of *Alstroemeria* have come to light thus far. They are all native to South America. More than half of them are found in Chile and surrounding countries.

This genus was founded in 1762 by the great Swedish botanist Carolus Linnaeus (Karl von Linné). It is of interest that there are some species that have been described in 1763 by Adanson under the name of *Ligtu* and there are others that were named in 1836 by Rafinesque as *Lilovia* and later on as *Priopetalon*.

According to Pax and Hoffmann,¹ the place of *Alstroemeria* with reference to the other genera of the *Amaryllidaceae*, is as follows: They form part of the subfamily *Hypoxidoideae* to which also belong the genera *Bomarea* Mirb., *Lentichis* Phil., and *Schickendantzia* Pax. Among these only a few species of *Bomarea* are known to the horticultural world. In fact there are some species of this genus that were once described as *Alstroemeria*, especially by Ruiz and Pavon² but later on transferred to *Bomarea*. Hutchinson in 1934 elevated this group into a family, *Alstroemeriaceae*.

Our genus was named by Carolus Linnaeus³ in honor to his friend M. Alstroemer whose father was at that time the well known Counselor of the Swedish Chamber of Commerce. Linnaeus received seeds from Père Feuillée in Peru through Alstroemer via Cadiz. Père Feuillée ranked the plants among *Hemerocallis*. The first species, and therefore the leading one with which other species have to be compared, was named *Alstroemeria peregrina*. Linnaeus shows an excellent illustration in Plate III of his work. Then follows the descriptions of *A. ligtu*, from Chile, and the third species, *A. salsilla*. This one was later transferred by Mirbel⁴ in 1804 to the Genus *Bomarea*.

In one of the most outstanding works on the flora of Peru and Chile, namely that of Ruiz and Pavon,⁵ we find a number of the earliest descriptions of *Alstroemeria* species. These pioneer botanists describe a total of 22 species. They all are illustrated on large folio plates. We notice here, for example, original descriptions of *A. haemantha*, *A. revoluta* and *A. versicolor*, all from Chile. There we find also *A. lineatifolia*, (See Plate 191), *A. distichiflora*, *A. anceps*, *A. rosea*, *A. bracteata*, *A. denticulata*, *A. macrocarpa*, *A. cordifolia* and *A. latifolia* from the Peruvian Andes. No doubt *A. denticulata*, *A. macrocarpa*, and *A. latifolia* (See Plate 191), are of horticultural value.

Of interest is another work of later date, namely that of Herbert.⁶ Several of his 29 species of *Alstroemeria* are well illustrated on a number of plates in black and white. He had also acquired much experience in raising various species, more than any other grower of that or our time. He noticed considerable variation among the seedlings that were considered as species. He states that *A. psittacina* Lehm. (syn. *A. pulchella* L.), *A. haemantha* Ruiz et Pav., and *A. aurantiaca* D. Don., "flower well in the open ground if well covered with straw or a thick coat of leaves in the winter. The soil should be light, and the tubers set pretty deep; and any heading that would throw the wet off in the winter will be found advantageous." He also discovered that the flowers are proterandric namely "that the stigma does not come to perfection until after the decay of the anthers." He also noticed that the

¹F. Pax und K. Hoffman. Amaryllidaceae in Engler und Prantl. Die Natürlichen Pflanzenfamilien. Vol. 15-a. Leipzig, 1930.

²Hippolyto Ruiz et Josepho Pavon, Flora Peruviana et Chilensis. Tom. III Madrid, 1802.

³Carolus Linnaeus. Plantae Alstroemeria in Amoenitates Academicae. Tom. VI 247-262, Upsaliae, 1762.

⁴Charles Mirbel. Histoire Nat. des Plantes Tom. IX: 71. Paris, 1804.

⁵Hippolyti Ruiz et Josepho Pavon. Flora Peruviana et Chilensis. Tom. III: 58-64, Plates CCLXXXVIII-CCXCVI, Madrid 1802.

⁶William Herbert. Amaryllidaceae 88-101, London 1837.

late development of the stigma should make the genus very liable to spontaneous intermixture of various species. This condition has been studied in more detail in recent years by Urban⁷ in Chile. Herbert described in his interesting and well known work a number of new species, for example, *A. inodora*, known from the crevices of rocks near Solta, southern Brazil; *A. macraera*, originally found near Valparaiso, Chile; *A. pygmaea* from the neighborhood of Pasco, Peru. He describes this species as a curious little plant unlike *Alstroemeria* in many respects. However it is still considered as a member of this genus (see also Index Kewensis). *A. pygmaea* grows only in the highest elevations of the Cordillera in rich black soil, reaching a height of not more than two inches. Among his other new species is *A. Isabellana* which was received by Sir W. Hooker from Mr. Tweedie who stated that it is one of the most beautiful species of Rio Grande. It grows in the mountain marshes and rough pastures of that region and was very abundant near Portalegró, Brazil. Its flowers are orange tipped with green. The last of the species described by Herbert in his Amaryllidaceae is *A. subrosulacea* from Chile. The flower stalk has but few leaves, the flowers are 1¼ inches long, with evanescent color. He also described some interesting species in Botanical Register⁸ among which *A. magnifica*, allied to *A. ligtu* L., is native of Chile. He also mentions *A. chorillensis*, native to the mountains of Peru.

It is interesting to read what more recent botanists have written about the occurrence of *Alstroemerias* in the region of the Andes and along the Pacific Ocean, on the basis of observations made in modern times. Among these we have Reiche⁹ who states that *A. violacea* Phil., occurs in the coastal section of the northern part of Chile, being one of the most beautiful species of that region, whereas *A. haemantha* Ruiz et Pav., *A. versicolor* Ruiz et Pav., and *A. ligtu* L., are most numerous in the central part of that country. Other species are found in the Cordillera at elevations of 2500 meters. Further he mentions how *A. peregrina* Ruiz et Pav., (and *Hippeastrum bicolor* Bak.) occurs in large numbers in the southern part of the province of Coquimbo, which is phyto-geographically one of the most interesting parts of Chile. These *Amaryllidaceae* are usually found between the xerophytic shrubbery, where there is in spring a rich vegetation, especially of flowering herbaceous plants. He states that in the southern provinces, mainly near Amorgos not far from Corral, *Alstroemeria aurantiaca* D. Don., occurs with many other interesting species along the margins of virgin forests and here and there in open places. Weberbauer¹⁰ tells us that among the species of *Alstroemeria* in the Andes of Peru *A. peregrina* Ruiz et Pav., is most widely known of any. It is an ornament among the hills around Lima. He found *A. pygmaea* Herb., growing on the prairies of the Central-Pe-

⁷ Otto Urban. Estudios sobre la biología de algunas plantas endémicas. Revista Chilena. Hist. Nat. Vol. 31: 46-49, 1928.

⁸ William Herbert. Miscellaneous Matter in Botanical Register. Vol. 29: 64, 1843.

⁹ Karl Reiche. Grundzüge der Pflanzenverbreitung in Chile. Vol. VIII of Engler und Prantl. Die Vegetation der Erde. Leipzig 1907.

¹⁰ A. Weberbauer. Die Pflanzenwelt der peruvianischen Anden Vol. XII of Engler und Prantl. Die Vegetation der Erde, Leipzig, 1911.



Upper, *Alstroemeria latifolia*, and lower, *A. lineatifolia*; from Ruiz et Pavon, *Flora Peruviana et Chilensis*, 1802.

ruvian Sierra-zone at an elevation of 2900 meters where there is a great wealth of herbaceous plants but a scarcity of trees and shrubs.

Let us now consider the *Alstroemerias* growing on the other side of the Andes, namely in Brazil. Good descriptions of plants from that country are found in the famous and expensive *Flora Brasiliensis*.¹¹ The chief author is Schenck. Later on Baker¹² gave a more complete enumeration of the species. He admits 19 species, of which 5 are new, namely *A. scaberula*, from Goyaz growing in bushy places near the Mission of Douro; *A. platyphylla*, from Chapoda at Nostra Senhora d'Abadia; *A. Gardneri*, from moist places near the same locality; *A. Burchellii*, from the hills near the city of Goyaz, and *A. zamioides* from dry, shady places on the Sierra de Natividade near Goyaz. At the present time about 40 species of *Alstroemeria* are known from the Republic of Brazil. One of the last to be described from that country is *A. buhantensis* Hoehne,¹³ from the vicinity of Sao Paulo.

The history, botany and geography of the genus *Alstroemeria* have been reviewed in order to show the reader something of the enormous wealth of species in this interesting genus of which there is so very little under cultivation, but which promises so much for the future of our gardeners. Horticulturally the best known species is *A. aurantiaca* D. Don., followed by *A. chilensis*, sometimes called Chilean Lily. These are not only of value as garden subjects, but also are outstanding as cut flowers. Species occasionally found in collections are *A. pulchella* L., *A. pelegrina* L., *A. violacea* Phill., and *A. revoluta* Ruiz et Pavon.

From my own observations made in Holland, Germany and England I know that the plants are frequently propagated from seeds. They are planted in February, sometimes as early as January, in pots or deep seed pans filled with a sandy soil. They are left to germinate in a temperate greenhouse, sometimes in a hotbed or frame. With fresh, well kept seeds, one should not have any difficulties in obtaining healthy plants. Sometimes the seeds are planted out of doors in May, where they should be sown in a protected place. When the seedlings are about 1 inch high they are transplanted. Those planted in February in the hothouse are later transferred to small pots. Those originally sown out of doors are usually planted out in beds about 8 inches apart in a light, sandy, but fertile soil. During the rest of the summer the beds are kept free of weeds, and the soil is cultivated once in a while in order that air may easily penetrate into the soil for the benefit of the roots.

Shortly before approaching frost, the surface of the soil is either covered with a layer of straw or leaves, or a layer of soil to a thickness of about 6 or 7 inches is placed over the bed. Some nurserymen observed in the latter instance that plants will pass through the winter

¹¹ **A. Schenck.** *Alstroemeria* in **Martius.** *Flora Brasiliensis.* Vol. 3, pt. 1. Monachii et Lipsiae, 1871.

¹² **J. G. Baker.** On the Brazilian species of *Alstroemeria*. *Journ. of Bot.* Vol. 15: 259-262, 1877. See also:

J. G. Baker. *Handbook of the Amaryllidaceae* 133-142, London, 1888. (In this work B. mentions 44 species of *Alstroemeria*.)

¹³ **F. C. Hoehne.** *Uma Alstroemeria nova dos arredores de Sao Paulo.* *Revista Museo Paulista.* Vol. 15: 481-489, 1919.

in good condition and that they will flower more profusely during the following summer.

Sometimes *Alstroemerias* are grown in 8 to 10 inch pots. These pots are filled with a mixture of sand and loam derived from decayed leaves and compost. They are planted in pots in October; are kept in a frost free place, and in a slightly moist condition. When the first shoots show above the soil, the pots are placed in the greenhouse close to the glass. After the middle of May they are planted out of doors in a semi-shady, well protected place. Treated in this manner, they will flower earlier in the summer than plants kept out of doors throughout the entire winter. A number of species can not be handled in this way because the roots are too fleshy for pot culture.

Little is known or has been recorded about *Alstroemeria* growing in such subtropical regions as Florida where there is no frost hazard. However, they survive as far north as Washington, D. C., or even farther north if covered with mulch in winter.

Alstroemerias are also propagated by division of the mature plants. This is usually done in the spring when the plants are at the end of their resting period. Sometimes they are propagated in this way in the fall. Due to the peculiar fleshy condition of the roots they should be handled carefully to cut down losses due to the decay following injury to the roots.

Although *Alstroemerias* are easily propagated from seeds, reproduction by division will probably prove to be the only safe method when hybrids and varieties are concerned because they do not come true from seeds.

BOMAREA OVATA AND OTHER CENTRAL AMERICAN BOMAREAS

J. C. TH. UPHOF, *Orlando, Florida*

When I was collecting species of epiphytic orchids in July 1938 with the help of native Indians in the tropical mountain jungles near Los Chorras, a small hamlet not very far from San Salvador, the capital of El Salvador, I found to my surprise a very attractive tall vine which I recognized at once as a species of *Bomarea*. A few vines of this species were hanging down from some high rocks, that were covered with *Achimenes longiflora* and other *Gesneriaceae*, a number of creeping aroids and some shrubs belonging to various families. Further up I found additional plants of this species that I identified as *Bomarea ovata* (Cav.) Mirb. This species has a wider range of distribution in tropical and subtropical America than any other *Bomarea*. It is worth while to draw here more attention to this interesting vine and to the entire Genus in general.

Bomarea ovata (Cav.) Mirb. is a herbaceous vine (Plate 192). A few stems arise at the base of the plant, about 2 to 5, in some instances more stems originate from the thick tuber. They are 3 to 5 mm. in diameter and reach a length of 2 to 6 meters. Not seldom they creep into the crowns of small trees, covering branch after branch. The leaves

are alternate, glabrous and lanceolate, rather long pointed, 4 to 10 cm. long, and 12 to 28 mm. wide. There are usually 7, somewhat parallel running veins, they are clearly visible on both sides of the leaf. The flowers occur on compound umbel-like inflorescences. The small umbels, umbellules, are usually two-flowered—one flower is more advanced than the other. At the base of the compound umbels occur 3 to 4 bracts. They are lanceolate to somewhat spatulate, 12 to 15 mm. long. At the base of the usually two-flowered small umbels there is one smaller lanceolate bract, 4 to 6 mm. long. Sometimes there is a small bract at the middle of the pedicel of the smaller flower of each umbellule.

The plants were flowering in July and August. The flowers were slightly bell-shaped, 2 to 2½ cm. long and 10 to 12 mm. in width. The inferior ovary is 2 to 4 mm. long, dark green and somewhat ribbed. The three outside members of the perigone are lanceolate, salmon colored, except that the part toward the tip is slightly greenish. The inside is lighter salmon colored. The halves of the sepals are folded inward. The three alternating members of the perigone are of the same length but are curved toward the middle in the lower half, and therefore appear to be spatulate. The outside is yellowish toward the midrib. The margin of the petals is deep green, the rest is light green. The inside of the petals is green to light green with three dotted, longitudinally running, dark purple stripes. There are 6 stamens that are formed in two cycles, 5 to 17 mm. long. The filaments are green to almost whitish. The anthers are deep violet. The ovary is inferior. The style is light green, 5 to 7 mm. long; the stigma is slightly three-cleft. Fruits and seeds are unknown to me.

According to Standley and Calderón *Bomarea ovata* (Cav.) Mirb., is thus far the only species that has been found in El Salvador.¹ Accordingly to the Index Kewensis² about 140 different species are thus far known. They have been cited as follows:

Index Kewensis (Main work)	73 species
Supplement 1896-1900	0 species
Supplement 1901-1905	1 species
Supplement 1906-1910	42 species
Supplement 1911-1915	20 species
Supplement 1916-1920	1 species
Supplement 1921-1925	2 species
Supplement 1926-1930	1 species
Total	140 species

The majority of the species of *Bomarea* are found in Columbia, Ecuador, Peru and Bolivia. The most are distributed in the region of the Andes where many grow from an elevation of 1500 meters up to the timberline. Many are not high climbing vines for some reach a height of only a few feet. About a dozen species are known from

¹ Paul C. Standley y Salvador Calderon. Lista Preliminar de las Plantas de El Salvador 52. San Salvador, 1922.

² B. D. Jackson et Jos. D. Hooker. Index Kewensis. Londini 1893-1895 and Supplements 1896-1930.

Brazil, but they are rarer as one goes southward. Only one species has been reported from Chile. Some *Bomareas* are known from the West Indies, but there are only a few species in southern Mexico.

The number of known species of *Bomarea* has been rapidly increased in recent years. Herbert³ admitted 44 species, and Baker⁴ included 75. The founder of this genus was Mirbel⁵ who segregated it from *Alstroemeria* which was founded by Linnaeus.⁶ The reason for this segregation I quote in Mirbel's own words: "Ce genre diffère du précédent (namely *Alstroemeria*) par les divisions du périanthe dont les extérieures ne sont pas reversées en arrière, pas les étamines qui sont droites et par la capsule qui est arrondie et aplatie de haut en bas."

As far as the first description of *B. ovata* is concerned, we find this plant first mentioned by Cavanilles⁷ under the name of *Alstroemeria ovata*. He describes the plant in Latin and gives a very extensive and thorough account of its morphological characteristics. He also gives a very accurate illustration of this species on Plate 76, leaving no doubt as to what plant he had in mind. I easily recognized from this drawing the plant I collected in El Salvador. He gives an illustration of the twig with flowers that form the compound umbel. He shows also two illustrations of the capsule. Cavanilles states that his plant came from Peru and mentions no other countries. Quite naturally Willdenow⁸ describes the plant under the same name. He refers to this species in German as "eijformige Alstroemerie."

The most northern distribution of this species is recorded from Mexico by Urbina.⁹ He reports it from Sierra de S. Felipe growing at a height of from 7000 to 8000 feet. He recognized also another species from that country namely *B. edulis* Herb. Lundell¹⁰ found *B. ovata* (Cav.) Mirb., somewhat southward near La Libertad Guatemala. Smith,¹¹ who has studied the flora of Guatemala over a much larger area, mentions *B. ovata* (Cav.) Mirb., from Santiago, Dept. Zacatepequez at 6500 feet elevation; from the volcano Acatenango in the same Department at 10,000 feet, and from Santa Rosa in the Dept. of Santa Rosa at 3000 feet. He also found *B. hirtella* Herb. from the neighborhood of the volcano Agua in the Department of Zacatepequez at 9000 feet; and *B. acutifolia* Herb., from the volcano Agua, and from San Miguel in the Department Quiche at 9000 feet elevation.

³ William Herbert. Amaryllidaceae. London 1837.

⁴ J. G. Baker. Handbook of the Amaryllideae. London, 1888.

⁵ C. F. Brisseau Mirbel. Histoire Naturelle Générale et Particulière des Plantes. Tom. 9: 71-72, Paris, 1804.

⁶ Carolus Linnaeus. Amoenit. Acad. Tom. 6. See also:

Carolus Linnaeus. Species Plantarum. Ed. Sec. Tom. I, 461. Holmiae, 1762.

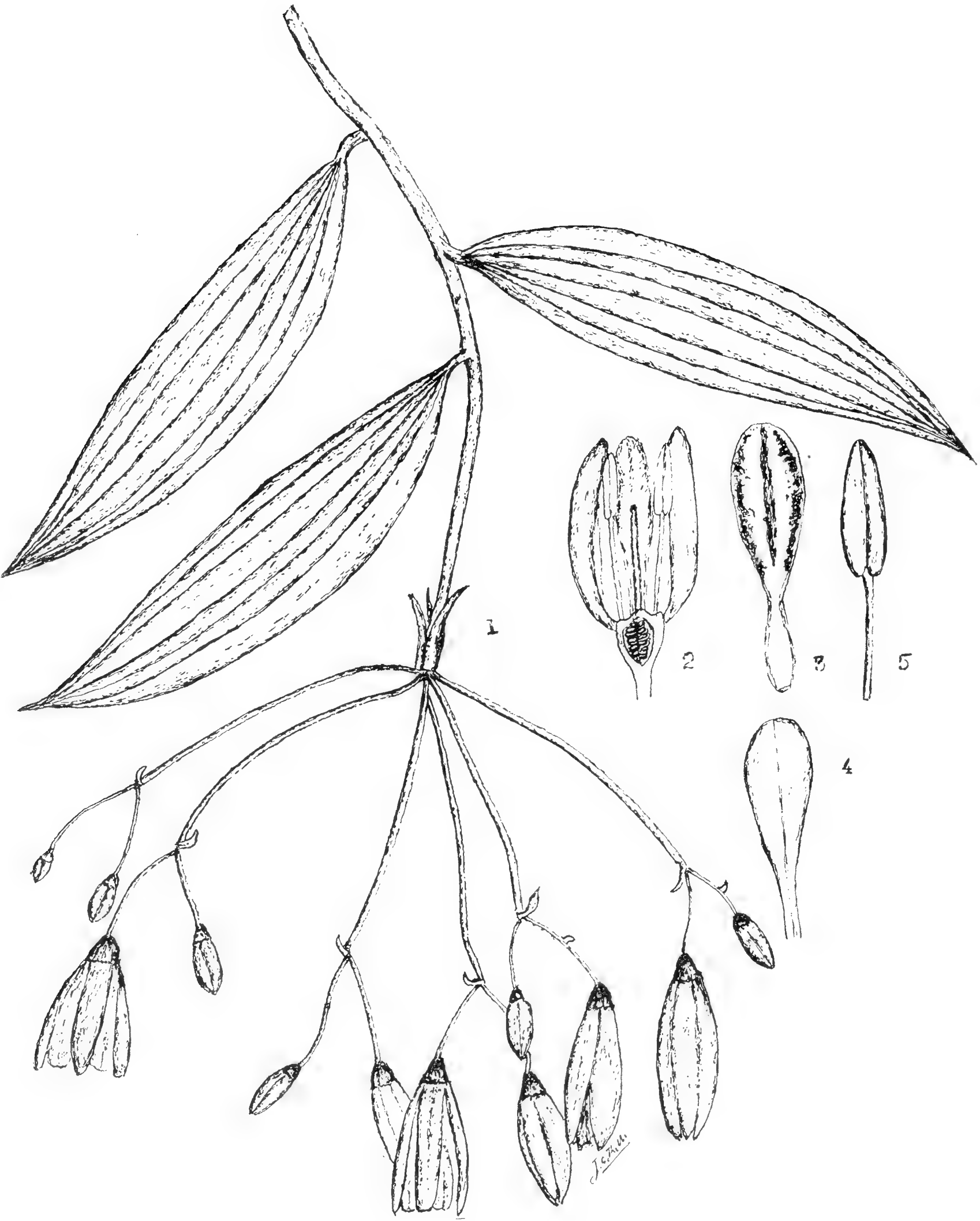
⁷ Ant. Iosephi Cavanilles. Icones et Descriptiones Plantarum quae aut sponte in Hispania crescent aut in Hortis Hospitantur. Tom. I: 54-55, Plate 76. Matriti, 1791.

⁸ C. L. Willdenow in Carolus Linnaeus. Species Plantarum Ed. Quart. Tom. II: 196, Berolini, 1799.

⁹ Manuel Urbina. Catalogo de Plantas Mexicanas. 348 Mexico, 1897.

¹⁰ Cyrus L. Lundell. The Vegetation of Petén. 163. Washington, 1937.

¹¹ John Donell Smith. Enumeratio Plantarum Guatemalensium necnon Salvadorensium Hondurensium Nicaraguensium Costaricensium. Oquakae, 1889-1907.



Bomarea ovata (Cav.) Mirb.

Standley and Calderón¹² mention *B. ovata* (Cav.) Mirb., as the only species from El Salvador, growing near San Salvador (the Capital) and Ahuachapan. A good illustration of this species is given by Chouse¹³ together with a short description.

I could find no mention of this plant genus with reference to the flora of Honduras. Goyena¹⁴ mentions *B. chontalensis* Seem., from Nicaragua. Standley¹⁵ enumerates a number of species from Costa Rica. *B. acutifolia* (Link et Otto) Herb. is common in forests of the higher mountains at elevations of 2000 to 3000 meters. He states that the root-tubers of this species as well as the others, are edible but have little flavor. *B. chontalensis* Seem., is reported from wet forests in the mountains. *B. costaricensis* Kränzlin was found in Cerro de Buena Vista and along the slopes of Irazú and Poá at 2000 to 3000 meters. The flowers of this endemic species are exceptionally large, about 5 cm. long. *P. edulis* (Tuss.) Herb., is mentioned from Papa de Venado, and seems to be common along the edges of forests, especially in the higher mountains at an elevation of 1400 to 3000 meters. *B. Porschiana* Cufidontis., is endemic on the volcano Turrialba at a height of 2500 feet.

Mirbel called this genus in honor of Bomare stating: "Bomarea, du nom du respectable Valmont du Bomare dont la vie laborieuse est consacrée a l'étude et à l'enseignement des sciences naturelles."

SAN SALVADOR, REPUBLICA DE EL SALVADOR,
SEPTEMBER 1938.

NOTES ON ALSTROEMERIA ACTIVITY ON THE WEST COAST

L. S. HANNABAL, *California*

Considerable interest in the culture and hybridizing of *Alstroemeria* is in evidence on the West Coast and this is due apparently to the fact that a number of species, with great color and growth variations, are available and provide a wide range of material to work with. It is natural therefore that no two breeders are attempting to duplicate or obtain the same results. The ultimate results therefore should yield some interesting hybrids for many of the *alstroemerias* hybridize very readily.

The University of California Botanical Garden probably has one of the best collections of material. This was obtained in their recent Andes expeditions. At present they are working toward the production of a plant type having a medium weight stalk carrying a large flower umbel. Some success has been obtained using *A. chilensis*, *A. Ligtu* and others.

Victor Reiter, Jr., of San Francisco is having considerable success in the development of an open flower umbel similar to that exhibited in the better forms of *A. pelegrina* var. *rosea*. Other growers are attempting to obtain new color ranges using both European hybrids and natural color variants of species as parents.

¹² Paul S. Standley y Salvador Calderón. Lista Preliminar de las Plantas de El Salvador. 52 San Salvador 1924.

¹³ Felix Choussy. Flora Salvadorena. Tom. III, 5 San Salvador, 1932.

¹⁴ Miguel Ramirez Goyena. Flora Nicaraguense. 797, Managua, 1909.

¹⁵ Paul C. Stanley. Flora of Costa Rica. Part I, 175, Chicago, 1937.

In fact so many variations are available that considerable question has come up regarding the earlier classifications of the species of *alstroemeria* and at present several workers, including Mr. H. L. Stinson of Seattle, Washington, and Mr. W. M. James of Las Positas Nursery, Santa Barbara, Calif., are attempting to re-check the earlier Latin descriptions and untangle the supposed natural Hybrids from the true species.

We look forward to preliminary reports from these workers in the near future with considerable interest.

NOTES ON ALSTROEMERIAS *

P. H. BRYDON, *California*

Two outstanding species of *Alstroemeria*, among a considerable number which were sent back by the recent Botanical Garden Expedition to the Andes, have bloomed this summer. The first, *Alstroemeria violacea*, promises to be one of the most outstanding contributions of the Expedition, since this is probably its first introduction into cultivation. Mature plants of this species attain a height of five feet and are found growing on the edge of the Atacama desert in Chile at an altitude of from 500 to 1,500 feet. The leaves on the sterile stems are ovate-oblong, two inches long, one inch wide, and shine as though lacquered. The flowering stems eventually reach a height of five feet and produce a compound umbel, six- to eight-rayed with as many as sixteen blossoms to the inflorescence. The flowers are a pleasing shade of Mauve (R. H. S. Color Chart 633/2), two and a quarter inches wide at the mouth, each segment being one and a half inches long. The lower half of the upper segments are white with scattered carmine spots. This species has responded to the same cultural treatment as other alstroemerias and, according to Baker in his *Amaryllideae*, 1888, it is related to *A. Ligtu*. The blossoms first appeared in June, approximately five months after germination, and continued to appear until late August.

The second interesting species is as yet unnamed and is referred to as "*Alstroemeria species* No. 39. 1220." It closely resembles *A. Ligtu* in growth, habit, and floral characters. The umbel is compound, six-rayed with six flowers to each ray. The individual blossoms are slightly smaller than the largest of the "*Ligtu-angustifolia* hybrids," and are a striking shade of Salmon Red. The lower segments are slightly longer than the upper, and tipped yellow with maroon stripes. A peculiar situation exists in the stamens, the anthers of which dehisce or abort about the time when the flower is opening although, in some instances, one stamen elongates to produce a large normal anther close to the exerted stigma. Our cytologists report that this species appears to have sixteen pairs of chromosomes as opposed to eight pairs in other species examined. Its flowering period is later than other species, commencing in June and continuing through August.

* Reprinted by permission from **Journal of the Calif. Hort. Soc.**, Vol. I No. 4, Oct. 1940.

Both of the above species are apparently much later in their blooming period than other species of hybrids now grown. It is conceivable that a race of hybrids may be produced which will extend the flowering period of alstroemerias until the middle of August. So far, we have been unable to cross the two above-mentioned species with either the "Ligtu-angustifolia hybrids" or *A. aurantiaca*, but hope that this may be possible in the future.

LEUCOCORYNE AS A POT PLANT

WYNDHAM HAYWARD, *Florida*

The novelty bulb from the uplands of Chile, *Leucocoryne ixioides* var. *odorata*, which has been growing more popular in the American horticultural trade in recent years, has a decided value as an ornamental pot plant for spring decoration purposes in the greenhouse and outside in warm climates.

The purpose of this note is to cite an example of the remarkable longevity of these bulbs and their power to retain their blooming power more than a year as dry bulbs out of the ground.

The facts are as follows: in the Fall of 1938, Mr. W. M. James, valued cooperator of the American Amaryllis Society in Santa Barbara, sent the writer some bulbs of *Leococoryne*, the beautiful "Glory of the Sun" as it is more commonly known. Some of these bulbs were given away and some were planted within a few weeks. About two dozen were left dry packed in peat in a small cardboard box on a shelf in the house.

The *Leucocoryne* bulbs planted in the fall of 1938 bloomed only indifferently in pots. Apparently this subject must be thoroughly ripened off before replanting. Some remained dormant in the ground and in pots, making only a little foliage. Other bulbs bloomed well. The writer did not save any of these bulbs of the previous planting, but in Fall of 1939 found the box with the balance of the bulbs which had been stored dry since the year before. There were about three dozen bulbs. They were dry and somewhat shrunken, but sound, and some showed signs of sprouting and of root growth, indicating that they were past their time of planting.

These three dozen bulbs, which had passed more than a year out of the ground in dry storage in a box, were planted one dozen in the open garden at Winter Park, Florida, and two dozen in a six inch pot. All grew quickly and thriftily, making luxuriant foliage and bloomed profusely in the spring of 1940. The illustration (Plate 193) accompanying this note shows a pot of the two dozen bulbs at the height of their beauty, about four months after planting.

DAYLILIES IN AN ILLINOIS GARDEN

MRS. ROLAND S. READ, *Illinois*

In Grandmother's garden, one of her most cherished plants was the Lemon Day Lily with its tall, grass-like foliage and spikes of fragrant, yellow lily-like flowers in May and today we still give it one of the



Wyndham Hayward, Winter Park, Fla.

See page 205

Leucocoryne ixioides var. *odorata* as a pot plant.

honored places in the garden for its beauty, its fragrance and for the lovely pictures which can be made by growing it in our perennial borders, especially near the bearded Iris. I have found that yellow and white are truly the accent colors for any mixed perennial border. These two colors, along with the gray foliated plants, give light and contrast to many plantings and beautify many flowers which in themselves are rather dull by creating flattering background values. Of the three, yellow is our happy, bright color and it is impossible to have too much of it. No yellow tone is so sparkling as that of the old fashioned daylily, *Hemerocallis flava*, no plant more rugged than the new hybrids of this great and lovely family, which bring to our gardens larger blossoms as well as flowers in which there are subtle shadings of red, apricot, pink, salmon, orange, yellow, buff and citron. A selected group of varieties will give bloom from early May throughout the summer until mid-September. The quality of "picture-making" so marked in *Hemerocallis flava* and even in *Hemerocallis fulva*, which has escaped from many old gardens to lift its tawny head in beautiful drifts along the roadway, is to be found in every variety.

A few named hybrids purchased this fall, planted carefully and slightly covered this winter, will reward you with a bloom or two next spring and the clump will increase rapidly in size and beauty.

Hemerocallis is truly one of the best plants for our fickle Illinois climate. They grow well in any garden soil which can support other perennials and they thrive equally as well in southern Illinois as in the northern part of the state. They withstand drouth and an excess of rain does them no harm. However during long, continued hot, dry weather, many of the tiny buds drop off while some buds are blooming but the plant lives and continues to increase in spite of the weather. I have planted *Hemerocallis* at all seasons of the year but I have found spring and fall planting best, in fact, early fall planting is the best of all.

It is worth while to take a little trouble with the planting. Plant in either full sun or partial shade, deciduous shade rather than the shade close to a northern wall. Dig a hole big enough and deep enough so the funny-looking, fleshy tubers and rootlets can be spread out. Place the plant so the brown, fiber-like coating of the green shoots is just under the surface soil. Add a little soil and then pour in a lot of water. Add a little more soil and then gently move the plant up and down. This method of planting is called muddling and it firms the roots into the soil. Add more soil around the plant and press down well. Add blood meal on top, then in a few days when the ground is dry, a shallow cultivation turns the blood meal under without any danger of burning the roots or rotting the stalk.

I use blood meal on all *Hemerocallis* for its quick results in growth and for the fine color it gives the leaves and blossoms. In two or three years the plant may be lifted, cleaned with a hose and cut so that each piece will have a few sprouts with some of the tuberous roots attached. Cut down through the plant, following the natural grouping of the stalk clusters. If the pieces are too small, it may be a year or two before the plant blossoms, however, the plant increase is often worth the sacrifice.

If the plants are set out in the fall, a light covering of straw or leaves put on after freezing weather is advisable. Most perennials benefit by such winter protection in the widely fluctuating temperature of Illinois. Hemerocallis foliage, if left alone, will act as a natural crown protection. However if the foliage is cut off in the fall cleanup, then do not fail to cover to prevent heaving.

The only pests I have ever found on Hemerocallis are grasshoppers and the Iris borer. A spray of arsenate of lead is fine for both. Locating the borer is the same in Hemerocallis foliage as in the Iris foliage.

The varieties of Hemerocallis are many and varied. There are many lovely new ones. Unless one has a very large garden, it will not pay to buy without seeing the varieties in bloom as there are many varieties that are quite similar in size and color with differences so slight that only specialists can detect them. I will list a few of my favorite varieties here and urge you to visit a grower's garden next spring and summer for there are a great many varieties available and your garden should be made up of your own favorites:

Hyperion (Mead); One of the best, it has huge, soft, canary-yellow flowers of excellent form and height. It blooms in July and August and it is not unusual for each stalk to carry 20 or more buds. *Ophir* (Farr); The flower is large and with the petals gently recurved; is a rich yellow, overlaid with gold. It is truly a lovely color. There are often more than 25 buds on a stalk. It is quite tall and blooms in July. *Cinnabar* (Stout); The recurving petals of deep yellow have a large area midway in the center of rose brown. The throat is pure yellow. *George Yeld* is similar. Both are lovely. *Mikado* (Stout); a variety of very great beauty. *Mikado* always stands out in a garden planting. The flower is a fine, clear, deep yellow. On the three upper petals there is a large deep orange-red spot. The center petal is much deeper in tone than the others. The throat is red-gold. It is very tall and blooms in July and August. *Anna Betscher* (Betscher); This is a lovely deep orange-yellow shade with reddish-bronze—July and August. *Aureole*; This is a fine, early variety, always blooming with the Iris. It is a lovely deep yellow-orange with a soft overlay of brown on the petals. This variety does very well in part shade. *Dr. Regel*; A fragrant orange-yellow of a clear, soft color. It blooms early and is excellent for cutting. The color is perfect in a border planting. *H. minor*; A tiny, clear yellow flower for edgings or the rock garden. The foliage is neat and grasslike, the stalks about 12" high are loaded with buds. Bloom in June. *Sungold*; Early June-flowering, large, deep gold flowers with very broad petals. Many buds on the tall stalks and the whole plant is very effective. *Golden Dream*, *Bay State*, *Goldeni* are very similar in color but are not nearly so large. *Golden West*; A lovely large orange-yellow flower of great substance, it is quite tall and blooms from July until September. *Golden Empress*; Another lovely soft orange-yellow, a late variety. *Sonny* (Stout); One of the pale yellow, tall varieties for midsummer blooming. It withstands the hot summer days without fading. *Dover*, *Gipsy*, *Sir Michael Foster*, and *The Gem* are also very excellent. These few have proved their value in my garden and as time

goes on others will move in beside them. Deeper, richer colors are available as well as pinks but they are still quite high-priced but we are having something to look forward to. I am only commenting on the ones that have already bloomed for me in my garden.

FLOWERING PERIODS FOR CLONAL VARIETIES OF DAYLILIES¹

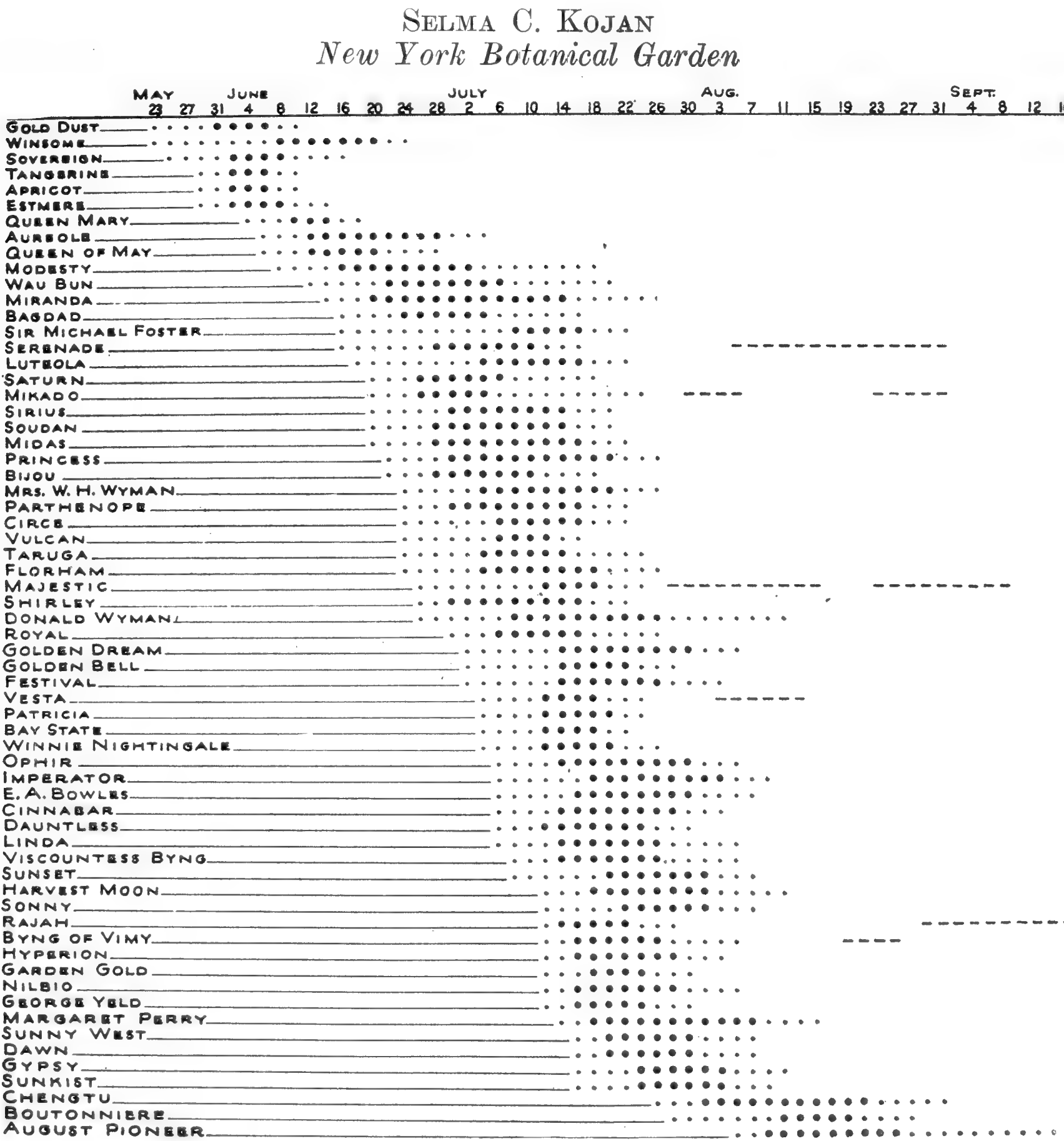


Fig. 57. Chart showing blooming periods of 64 daylily clones in the display collection at the New York Botanical Garden in 1939.

The accompanying chart, Fig. 57, indicates the periods of blooming during 1939 for 64 clonal varieties of daylilies which are growing in the display collection at the New York Botanical Garden. The names are

¹The observations here reported were made by Miss Selma C. Kojan in connection with a scholarship grant from The New York Botanical Garden. A. B. Stout.

arranged in sequence according to the earliest date of bloom for each clone². The large dots indicate the period of maximum bloom for the ramets (members of a clone) which were under observation. The first series of small dots indicates the period during which there was increase in the amount of bloom; the last series indicates decreasing bloom. Second and third periods of flowering are indicated on the chart by dashes.

The clones selected for this list include the earliest and the latest to flower during 1939 of all the named horticultural clones grown at the New York Botanical Garden. For nearly every one of these there were three well-developed plants or ramets in excellent condition of growth. Thus, it was possible to obtain adequate data during the same season on the normal period of flowering for these daylilies.

There were in the display collection numerous other clones of which there was only one ramet each or of which all the plants were not yet well-developed. But in 1939 none of these flowered earlier or later than the dates given in the chart.

The *Gold Dust Daylily*, which flowered from the 23rd of May to the 10th of June, was the first of all the named clones to bloom in 1939. However, in 1937 the same ramets of *Gold Dust* started blooming on the 12th of May, but in that year blooming was very generally earlier. The *August Pioneer Daylily*, which bloomed in 1939 from August 5th., to September 14th., was the very latest of all named clones to bloom at the Garden. A glance at the chart will show that there was a continuous succession of clones in flower between these two extremes. Of the several clones in bloom at any one date, some were in increasing bloom; some were in maximum bloom; and others were decreasing in bloom.

In 1939 the two daylilies *Tangerine* and *Apricot* began flowering on May 28th and finished flowering on the 10th of June, a period of 14 days. It may be noted that these two early-blooming clones had the shortest periods of bloom of all of the named clones growing at the Garden. In 1937 the same three ramets of *Apricot* bloomed for 21 days, a week longer than they did in 1939. Observations made over a period of years indicate that a short duration of bloom is normal and characteristic of these two daylilies. In contrast, as shown in the chart, the daylilies *Modesty*, *Miranda*, *Donald Wyman*, and *August Pioneer* had in 1939, very long periods of flowering, in one case as long as 48 days.

It has been observed that two clones may have periods of bloom which coincide closely, and yet the time and extent of maximum blooming and the number of blooming periods may not be the same for both. Pairs of clones which in 1939 exhibited this condition are: *Bagdad* and *Serenade*, *Sirius* and *Soudan*, *Parthenope* and *Circe*, *Mrs. W. H. Wyman* and *Florham*, *Vesta* and *Patricia*, *Ophir* and *Linda*, *Byng of Vimy* and *Nilbio*, *Dawn* and *Sunny West*.

In 1939, *Vesta*, an evergreen daylily, had a second period of flowering as is indicated on the chart by dashes. In some years the daylilies *Mikado* and *Majestic*, also evergreen, suffer from severe winter injury, and their late-blooming scapes arise in buds which are of small size in

² A group of plants, all of which have arisen from a single individual by repeated vegetative propagation.

early summer but which grow rapidly and produce scapes later in summer. These two clonal varieties had second and also third periods of flowering in 1939. A number of evergreen daylilies had in this same year only one period of flowering. *Luteola*, *Soudan*, *Princess*, *Vulcan*, and *Sonny* are a few of the named clones belonging to this group. Second periods of flowering, however, are not limited to clones of evergreen habit, but may be induced in ramets of discontinuous growth by winter injury or abnormal conditions of weather or culture. In 1939 the clonal varieties *Serenade*, *Rajah* and *Byng of Vimy*, which are discontinuous in growth, had also second periods of flowering. In this year from two to thirty days elapsed between the first and second periods of bloom for all the daylilies mentioned. In no case has a second period of blooming been equal to the first period in the number of flowers open during any one day.

There are several clonal varieties which were in bloom at the same time that are quite similar in stature, habit, and character of flower. *Gold Dust* and *Sovereign*, two of the early-blooming clones, were in bloom at the same time. They have much the same habit of growth and stature, but the flowers of *Sovereign* are somewhat paler than those of *Gold Dust*. Therefore, the gardener may wish to have both of these growing in the garden. *Queen Mary*, *Aureole*, and *Queen of May*, which flowered together, are very similar in flower, foliage, and habit of growth. Hence, the gardener may want to make a critical selection from this group. The same is true for *Miranda* and *Golden Bell*. The daylilies *Luteola*, *Florham*, and *Shirley*, which bloom during June and July, also bear quite a marked resemblance to each other.

The observations made at the New York Botanical Garden over a period of several years do not fully agree with some of the statements made in reference to the flowering of certain daylilies. It was reported in 1939 that the clone *Earlianna* began flowering on May 13th, two weeks earlier than did the *Dr. Regal Daylily*. In 1939 at the New York Botanical Garden the *Dr. Regal Daylily* began flowering on May 24th, but in former years the same ramets of this clone have started to bloom as early as May 11th and have never flowered later than June 8th. In the display collection at the New York Botanical Garden there is one ramet of *Earlianna* which was planted in the early spring of 1938. That year its first flower opened on May 26th; in 1939 its first flower opened on June 1st. In the collection there are a number of other daylilies including six clonal varieties and some unnamed types which flowered in 1939 at an earlier date than did the *Earlianna Daylily*.

Another case may be mentioned. It has been claimed that the clone *Mrs. W. H. Wyman* is "extremely late flowering," but at the New York Botanical Garden over a period of 9 years, the earliest date of bloom for plants of this clone was on June 24th, and none of them has flowered later than July 30th. Of those listed in the chart, there are 35 clonal varieties that have bloomed later in 1939 than the clone *Mrs. W. H. Wyman*.

Frequently ramets of daylilies bloom out of their normal season or are irregular and erratic in blooming. Severe winter injury, unusual

conditions of weather, recent planting, a crowded condition, and need for transplanting all affect the amount of bloom and the extent of the period of flowering. In his book entitled *Daylilies*, Dr. A. B. Stout reports that there is often considerable fluctuation from year to year for the same ramets with as many as 10 to 15 days difference in the dates of opening of the first and last flower. There are also differences from year to year in the dates for climax of bloom and for the extent of the period of bloom. The dates of flowering will also differ in countries according to climate and latitude, and much difference can be expected in different parts of the United States. However, the relative season for flowering is the same from year to year for each of the various clonal varieties. In no case has a daylily normally bloomed early in spring in one year and late in summer in another year.

In the display collection at the Garden there were three ramets for nearly every clone listed, each growing in the same position three years or longer, and each in a lusty and robust condition. Thus the data for 1939 which is presented in the chart are quite adequate for indicating the relative periods of normal flowering which are characteristic of the clones listed. In every case the ramets observed are, it is believed, true to the name first definitely applied. But it is known that for several clones here listed, certain plants which are in garden cultivation under the same names are incorrectly named.

Flowering behavior is a feature of importance in considering the relative merits of the daylilies. At the New York Botanical Garden numerous clonal varieties are grown for public display, and gardeners are cordially invited to observe the daylilies in this large collection. It is hoped that the blooming data presented here will assist the gardener in making evaluations of the merits of the various daylilies for use in garden culture.

DAYLILY FOLIAGE AS AN ELEMENT IN THE GARDEN DESIGN

JOHN V. WATKINS

Assistant Professor, Horticulture, University of Florida

The owners of southern gardens have come to appreciate the extreme usefulness of daylilies for strong garden color that comes into its greatest show just as the cool-weather annuals are beginning to wane in April and May. This excellent group of garden herbs is rather diverse in foliage behavior as well as in flower form and color and we gardeners of the Gulf Coast will do well to ponder upon the important factor of evergreen habit. Even when it is out of bloom, a well established clump of *Hemerocallis aurantiaca* will furnish a good green mass of attractive foliage as a part of the garden picture. One eminent garden authority remarked that he would grow daylilies, though they never bloomed, for the joy of seeing the dew glisten on the fresh leaves each morning.

This evergreen character (See Plate 194) has the attention of plant breeders and they are all making serious attempts to breed this highly desirable factor into their new seedlings. That they are being successful is attested by the fact that many of the older types can now be replaced



John V. Watkins, Gainesville, Fla.

See page 212

Upper left, clone Domestico in early March; upper right, clone The Gem in winter; lower left, Mikado is dormant until spring; lower right, Hyperion is completely dormant until rather late in spring in Florida.

by newer sorts of similar flower form and color, but with foliage evergreen instead of deciduous. The southern hybridizer who has the best interests of the genus *Hemerocallis* at heart will not rest until his seedlings show the ability to furnish good green masses of crisp foliage the year round.

Though we admire the evergreen clones as excellent components of the garden picture, we cannot overlook the surprise element, the attractive seasonal appearance and spring freshness of the deciduous varieties (See Plate 194). Many clones of this class are well known for their superlatively attractive leaves. *Hyperion* and *Ophir*, for example, are distinctly deciduous in character, pushing their leaves through the ground rather late in the southern spring, yet their leaves are beautifully dark green holding their pristine freshness long after some of the robust evergreen kinds have commenced to turn brown in the hot sun of late summer.

Perhaps a good method of planting the two types of daylilies might be worked out as follows. Set a large drift, consisting of 20 plants of the evergreen *Dauntless*, in front of a shrubbery border; just next to this arrange a group of deciduous *Linda*, then a bold mass of *Vulcan* may come next to furnish crisp green foliage all winter in front of the darker green of the evergreen shrubs.

In the Daylily Display Garden on the campus of the University of Florida, 134 named varieties are growing under garden conditions that are typical for most of Florida. Notes are being taken continuously on the behavior of these plants and many of the findings should be helpful to gardeners.

Following the extremely low temperatures of January, 1940, the plants were carefully scored for foliage effect, and the results are recorded on the next page. These 1940 records were checked against those for 1938 and 1939 and it was found that foliage behavior is consistent for each given variety. The unstarred clones can be depended upon to furnish foliage for garden effect during most of the winter. The leaves of the evergreen daylilies were badly yellowed by a temperature which was recorded officially as 17° F, although they are usually unharmed by frosts and temperatures in the high twenties.

Of the 134 clones listed in the accompanying table, it is seen that 22 are designated as "F". These daylilies are fully evergreen and are characterized by excellent foliage masses which are of great merit in our winter gardens. The 18 varieties classed as "G" make a good winter show but the leaf masses are not quite as heavy and robust perhaps as in those of the foregoing group.

The plants marked "H" and "I" are variable and these classifications should not be considered indisputable as there will be some overlapping. Some of these sorts have very short periods of dormancy while others recover and produce low, sparse leaf masses after several weeks. None of these furnishes winter-long mounds of evergreen foliage.

FOLIAGE BEHAVIOR OF THE DAYLILIES IN THE DISPLAY GARDEN AT THE
FLORIDA AGRICULTURAL EXPERIMENT STATION, GAINESVILLE¹

F Ajax	S Fulva maculata*	H Ophir*
S Alba striata*	S Fulva rosea*	S Orangeman*
G Amaryllis	S Fulva wild type*	S Pale Moon*
S Apricot*	G Gem, The	G Parthenope
F Aurantiaca	I Gloriana	G Patricia
F Aurantiaca major	S Golconda*	S Perry, Gladys*
F Aureole	S Gold Dust*	F Perry, Iris
F Aurillo	S Gold Imperial*	S Perry, Marg.*
S Austin, Mrs. A. H.*	F Golden Bell	S Perry, Mrs.*
S August Pioneer*	S Golden Dream*	S Perry, Thelma*
S Bardeley*	F Golden Mantle	G Queen of May
S Baroni*	G Golden West	S Radiant*
S Bagdad*	S Goldeni*	S Rajah*
S Bay State*	S Gracilis*	S Regel, Dr.*
I Betscher, Anna	S Guiseppi, Cissy*	F Royal
S Bijou*	H Gypsy	S Salem*
S Boutonnierre*	I Hankow	S Seith, Mrs.*
S Bowles, E. A.*	G Harvest Moon	F Shirley
S Brownie*	S Hend. Giant Orange*	F Sir Michael Foster 1-3
S Burbank*	S Hippeastrum*	F Sir Michael Foster #4
S Burmah*	F Hume, Emily	S Sirius*
S Byng of Vimy*	F Hy. Semperflorens	I Serenade*
S Calypso*	S Hyperion*	F Sonny
H Chengtu*	I Kwanso*	H Soudan
G Chisca	G Ladhams, B.	S Sovereign*
G Chrome Orange	S Lady F. Hesketh*	S Sungold*
G Cinnabar	S Lemon Queen*	S Sunny West*
S Citronella*	S Lemona*	S Tangerine*
S Crawford, J. A.*	S Linda*	S Taplow Yellow*
H Cressida	G Lovett's Lemon	S Thunbergii*
H Curlypate	G Lovett's Orange	S Tigert, Mrs. John J.*
F Dauntless	F Luteola major	I Vesta
S Dawn*	S Luteola palens*	F Vulcan
S Dazzler*	S Mandarin*	H Virginica*
F Domestico	G Mann, Mrs. J. R.	G Wau Bun
H Dwarf Yellow	S May Morn*	F White, Lilla
G Eldorado	I Midas*	S Winsome*
F Erica	I Mikado*	S Wondergold*
S Estmere*	S Minor #3*	I Woodlot Gold
S Europa*	F Miranda	S Wyman, D. D.*
S Festival*	I Modesty	I Wyman, Mrs. W. H.*
S Flamid*	S Mulleri*	I Yeld, George*
S Flavinia*	S Multiflora*	S Yellow Hammer #1*
G Florham	H Nocerensis	G Yellow Hammer #2
S Fulva cypriana*	S Ochroleuca*	

¹ Symbols used in this table:
F—Full garden value throughout the winter in peninsular Florida.
G—Good garden value during the winter.
H—Buds stand perhaps 6" above the ground. There is no garden value in winter.
I—Buds stand perhaps 4" above the ground. There is no garden value in winter.
S—Very short buds that stand perhaps 1" above the earth.
*—Completely deciduous, no garden value during the winter. —J. V. W.

THE MILDRED ORPET DAYLILY IN CALIFORNIA

I did find the only real collection of *Hemerocallis* in this town this morning, and brought home samples for comparison from those in bloom,—*Calypso*, *Cinnabar*, *Bagdad* and *Chengtu*. *Mildred Orpet* certainly has more style in the shape of the flower than any of them, to my mind,—for one thing, her triangles are much more acutely defined, and there is just enough frill on her petals to make a good contrast with the severe sepal outlines, and her coloration is lovely and subtle. The sepals look somewhat like the flesh of a freshly sliced peach, but have a tone of their own that I cannot find a word for. The gold-brown patina of the petals is more like the color you find in *Cymbidiums* (*Orchidaceae*) than anything else I can think of at the moment. My plant bloomed in early summer and stopped, only to start in again this month and it is still full of buds. The stem measures exactly thirty inches.

Hemerocallis have not as yet found a real place in this part of California,—maybe because no one has taken a deep enough interest in them to push them as they deserve, but in the garden that I visited this morning they make a glorious spot, backed with rare *Hibiscus* that are also in bloom.

—*Mildred Orpet*

Santa Barbara, California,
September 24, 1940

HYBRID AMARYLLIS IN GEORGIA

ARTHUR J. JONES, *Georgia*

Lets pull up a chair and chat a little on Giant Hybrid Amaryllis. How far north can they be field grown successfully? (See Plate 195) Atlanta being about 325 miles north of Jacksonville, Florida and having an altitude of 1000 ft., the north and northwest winds send the thermometer plenty low at times during the winter months. While I write this, Jan. 19th., the radio is announcing a warning of zero temperature before tomorrow morning. This is about 15 degrees lower than a normal winter's lowest temperature. Upon the first warning no time was lost getting out bales of straw which is kept ready for just such an emergency. For over a month the beds have been covered with 4 to 6 inches of leaves which gives ample protection in normal winters.

The location selected for the amaryllis beds is on the east side of a gentle slope. The soil is sandy red clay; well drained and somewhat protected from the afternoon sun.

The fertilizer used is heavy liquid manure placed in holes made with a broom handle to the depth of the roots between the rows. Twice during the growing season hardwood ashes are spread. This is alternated with an application of acid phosphate. No further treatment is required as the soil apparently has all other requirements to produce large blooms on 24-inch sturdy scapes. With this treatment the bulbs grow to an enormous size—many attain 6-inch diameter. Three scapes



A. J. Jones, Atlanta, Ga.

See page 216

Upper left, typical winter scene, Atlanta, Ga.; Upper right, hybrid amaryllis seedlings 10 months from seeds; lower, hybrid amaryllis seedlings in flats.

to the bulb is not unusual. Last season one small 2½-inch bulb showed 3 scapes totaling 13 blooms and averaging 5-inches across. After the growing season, upon examination, it was found that the bulb had increased over 1-inch proving that the heavy blooming had not affected the bulb. This bulb will be checked again this season. Many 16-month bulbs show numerous offsets. It is not uncommon to count 8 or more to the bulb (Plate 195).

Experiments show that the best soil for seed flats is, a 3-inch layer of 1/3 garden soil, 1/3 creek sand and 1/3 peat which had been used as a litter in the hen house. To this mixture is added 1 cup of chick size oyster-shell to counteract acid, one cup of acid phosphate for top growth, and 1 quart of hardwood ashes for bottom growth. The top layer is ½ garden soil; ½ sand. The seeds are planted in rows, almost touching, with just enough soil to prevent shifting, ¾ of each seed being exposed. The soil is kept dampened thru burlap until growth starts. The flats are then set in a sunny location, protected from wind and burlap is removed. As a protection from the strong sun; to prevent burning; old fashioned shutter blinds are placed at an angle. The shutters are set a desirable angle (Plate 195). These seed flats are standard 18"X24" and contain 350 to 400 seeds. The generation is about 75 per cent. The tiny plants seem crowded but apparently this crowding does no harm.

The seedlings go thru their first winter in a glassed in pit under the little greenhouse, a leanto affair on the south side of the building, which is used for potted bulbs selected the previous season in view of hand pollinating for seeds. This pit is 3 ft. below the grade. There is considerable glass surface, and as an added protection in extreme weather, a muslin cover is placed over the flats. When the temperature went to the low of 2°, two layers of paper were laid over the muslin cover. All came thru showing no signs of injury from the bitter cold snap without artificial heat.

When conditions are favorable for transplanting seedlings outside, the flats are wetted down thoroughly so that no tender roots are lost in handling. The bed 4 ft., wide has been made ready with mulch paper in place with holes cut 6 inches apart each way in which the seedlings are placed. The mulch paper not only helps to retain moisture but also radiates heat to the soil which remains warm all night. The paper also eliminates weeding. The life of mulch paper is short but answers the purpose as the plants have a good start before the paper breaks down. However, this season I will experiment with a light asphalt roofing paper. After one year the small bulbs will be thinned out. Those showing many offsets will be removed with ample soil to a bed set aside for them. The first bloom will determine the results of the hand pollinations. The most desirable are retained for further breeding.

I trust this article will prompt others still farther north to give their experiences. It will be interesting to know how far north amaryllis can be field grown successfully.



R. A. Dyer, Pretoria

See page 220

Nerine filifolia Baker

Plate 196

A NOTE ON NERINE FILIFOLIA BAKER

R. A. DYER

Division of Plant Industry, Pretoria

In January, 1937 Major B. Nicholson collected a few bulbs of *Nerine* near a stream in the neighbourhood of Mbabane, Swaziland, and forwarded them to the National Herbarium, Pretoria. Some of these bulbs flowered in the following April and were then identified with *N. filifolia* Baker. This identification indicates a very much wider range of distribution for the species than hitherto recorded. Previously according to Barker, under plate 568 (*Nerine filifolia* var *parviflora* Barker) in *Flowering Plants of South Africa*, it was known from the neighbourhood of Grahamstown in the eastern Cape Province to the district of Maclear and parts of the eastern Orange Free State. Thus a record in Swaziland is a considerable jump to the north-east. Before arriving at a decision as to the above identification the specimens were compared with *N. filamentosa* Barker, described and figured for the first time in *Flowering Plants of South Africa* plate 569 (1935) and again the "slender" nature of the specific distinction of this species from *N. filifolia* was felt.

The bulbs collected by Major Nicholson were planted in sandy loam in a 4 in. deep tray and given no special protection from sunlight or rain. By April, 1940 the tray was literally packed tight with bulbs which had increased greatly in numbers by budding during the intervening years. The photograph (Plate 196) reproduced here was taken then and gives some idea of the generous nature of this delicately beautiful plant.

Here follows a formal description of *Nerine filifolia* Baker taken largely from Curtis's Botanical Magazine, plate 6547 (1881) where the species was originally described:—

Bulb ovoid up to about 1 in. in diameter, growing in tufts or small clumps, outer tunic membranous, brown. *Leaves* up to 10 from a bulb at maturity but fewer in the young stages, contemporary with the flowers, very slender, weak, shorter than the scape or peduncle, glabrous, rounded on the back, channelled down the face. *Scape* about a foot long, slender, round, shortly but densely glandular-hairy; spathe-valves lanceolate, greenish. *Umbel* 3-10 flowered; pedicels spreading as they develop, densely glandular-hairy, usually longer than the flowers; perianth rose-red, about 1½ in. long; segments oblinear-lanceolate, up to about 1/12 in. broad, undulate on the margin towards the base, crisped and reflexed towards the apex, five of them usually more or less distinctly ascending and the sixth deflexed. *Stamens* about as long as the perianth, deflexed; filaments bright red; anthers dark red. *Style* at length longer than the stamens; stigma capitate. *Capsule* acutely lobed with two or three seeds in each cell.

7. HARVESTING, STORAGE AND FORCING

HARVESTING AND STORAGE OF AMARYLLID BULBS

W. M. JAMES, *California*

Proper care of bulbous plants during their dormant period is fully as important as it is while they are growing and flowering. A few amaryllids do best if left undisturbed—some kinds for several years. Others do better if dug after completion of their growing period and kept in storage until they are ready to grow again.



Fig. 58. Right, bulb storage racks and trays; left, showing heater in place for drying bulbs.

Harvesting presents no special difficulties other than finding ways and means to do it quickly and economically. Most amaryllids are ready to dig as soon as the foliage is ripened. Some—such as *Nerine filifolia* and many *Zephyranthes*—can be dug at any time without any appreciable setback if they are not dried out too much.

Where very large quantities of bulbs (such as *Narcissus*) are grown, digging is done almost entirely by specialized machinery. For smaller quantities, a screen such as that shown in the picture (Plate 197) is very useful. The trays are suspended from the frame so that they can be shaken easily and changed quickly. Trays with one-half inch or one-quarter inch mesh for the top and with one-eighth inch mesh or window

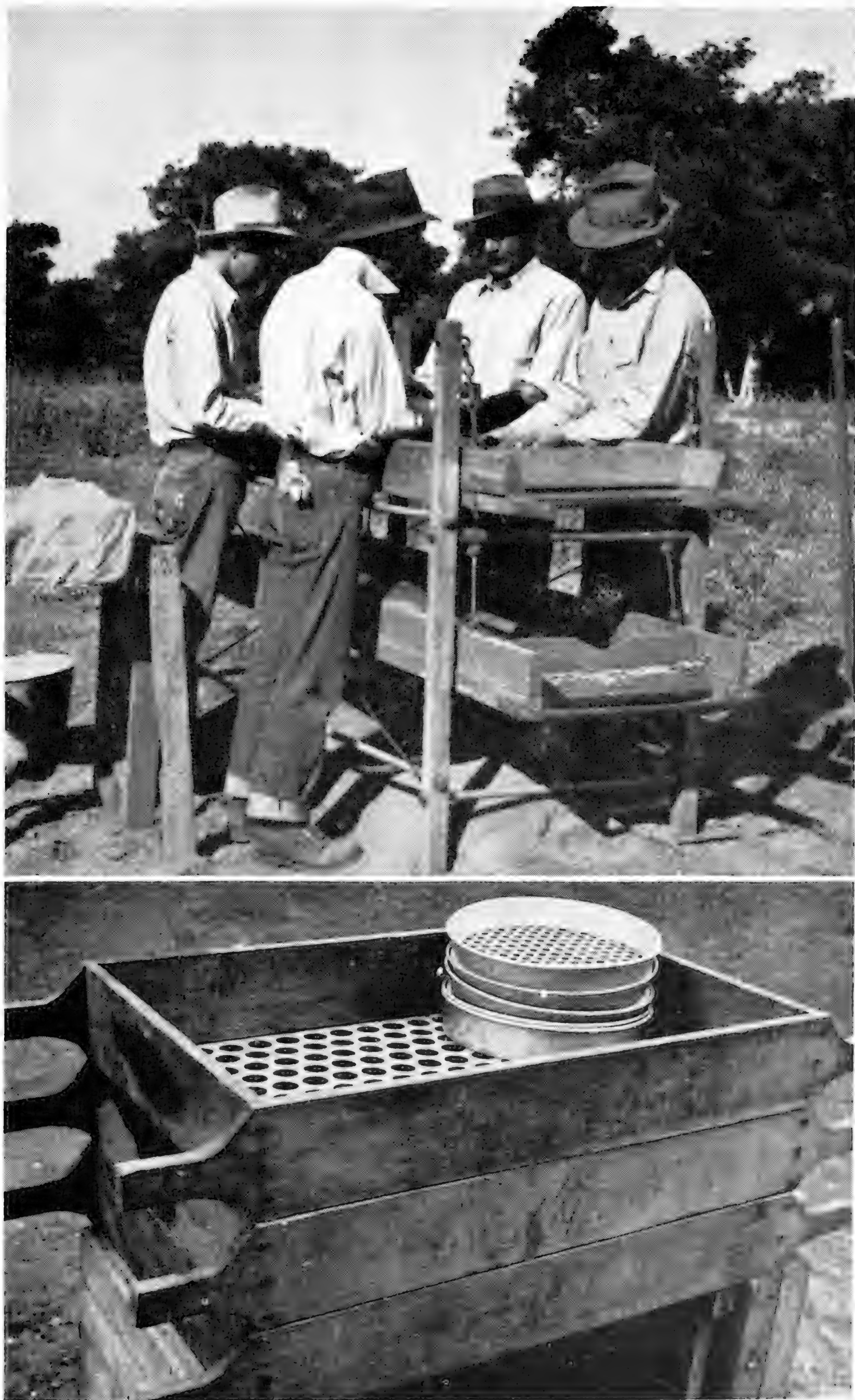
screen for the bottom can be combined for almost any size or type of bulbous plant. Large bulbs without small offsets can be easily dug with a shovel and picked up by hand. The storage trays described later on are very convenient for harvesting small amounts by hand.

Most amaryllids are best stored in trays or boxes under conditions where temperature and moisture can be under at least partial control. Again, where large quantities are handled, separate rooms or buildings are used and they are equipped with special trays or boxes best suited for the particular kind of bulb stored there. For general use in small or fairly large quantities, the racks and trays shown in the picture (Fig. 58) are very satisfactory. The shape and size can be varied to suit individual requirements. Those shown in the illustration are four inches by eighteen inches by twenty-four inches and have as a bottom small chicken wire netting, one-quarter inch hardware cloth or window screen. The very large bulbs are best stored in boxes. These boxes should be strong and so constructed that they can be stacked easily and securely, and yet have plenty of room for circulation of air. The name and any information desired can be written on a small piece of paper and attached to the front of the tray or box with a stapling machine. This is inexpensive, takes very little time and makes it possible to find any particular bulb very easily and quickly.

Storage facilities should be designed to take advantage of local conditions. For instance, an ideal box for many amaryllids for use either in the field or for storage can be made from parts of certain standard vegetable crates. Near vegetable growing areas or shoo factories this standard cut material can be purchased and made into boxes cheaper than they can be made on special order by a mill. Storage rooms should be constructed and arranged so that plenty of air circulation can be provided and so that temperature is fairly constant.

Some amaryllids, such as *Milla biflora* and *Brodiaea capitata*, are subject to molds in storage and must be dried quickly after being dug. A small room or box, with racks that will hold the storage strays, is almost necessary. It should be constructed so that there is room at the bottom for a small electric heater with a fan (Fig. 58). The top should be left loose so that an opening can be adjusted to regulate the amount of heat around the bulbs. A frame covered with sugar cane fibre-board is easy to construct, serviceable and very satisfactory for this purpose. With a fan to assure air circulation, a small heater and box of this type will handle a surprising number of bulbs.

Careful observation will soon indicate just how deep it is safe to pile the various kinds of bulbs in the trays or boxes; how much ventilation they need; how long they can be kept in storage etc. After the trays and racks are once obtained and installed, the "filing system" described will prove much more satisfactory than stacking the bulbs in boxes of various sizes and shapes.



W. M. James, Santa Barbara, Calif.

See page 221

Lower, bulb grading screens; upper, bulb grading screens in use.

8. THE SOCIETY'S PROGRESS *

SECRETARY'S MAIL BAG

Arthington Worsley, of Ventnor, Isle of Wight, England, writes under postmark of October 25th, 1940, that "We are all safe and no damage, and not a great deal elsewhere in Ventnor, and very few casualties, but plenty of noise of explosions and alarms". Mr. Worsley, an Honorary Fellow of the Society, and Dean of the amaryllid fraternity, tells of close-hand experiences of German bombing attacks on the Isle of Wight. He promises a photograph of a new species of *Eustephia*.

The big excitement in the American Amaryllid world in 1940 was due to the blooming of several bulbs of *Amaryllis procera*, the "Blue Amaryllis", during the spring months. Several growers have imported the huge, long-necked bulbs from Brazil in recent years. When their culture becomes better understood, these may become more frequent inhabitants of large conservatory and greenhouse collections, and even of window gardens.

The Kilgore Seed company of West Palm Beach, Florida recently announced plans to import fifty bulbs of the "Blue Amaryllis", *A. procera*, in the near future from Brazil. The estimated retail price of this rarity is about \$5.00 each. The bulbs are cheaper in Brazil, but there are heavy expenses of duty, shipment, clearing papers, etc.

The Royal Horticultural Society of England through Mr. B. O. Mulligan, Assistant to the Director, made available to the writer of these notes some seeds of a new pink *Zephyranthes* from Mexico, collected by E. K. Balls in 1938, and which were flowered at the RHS gardens at Wisley this year for the first time. Mr. Mulligan writes that the field notes state the original bulbs were found growing in "partially shaded places under shelter of rocks in broken lava beds, altitude 8,000 ft."

Major Albert Pam, corresponding member for Great Britain, writes from London that two of his plants that bloomed in his garden—*Alstroemeria nemorosa* and *Bomarea campaniflora*—are being figured in the Botanical Magazine. These were introduced by Maj. Pam from collections made in Sao Paulo, Brazil, in 1934. He writes "As you can imagine, all our thoughts are about the war at present, so it is a very pleasant break to receive letters about gardening and interesting events in horticulture and botany."

Major Pam tells of some bulbs of *Phaedranassa Carmioli* from Costa Rica coming into bloom. This plant has never been well figured, he adds, and may form the subject of another plate in the Botanical Magazine.

* The material in this section was prepared by Mr. Wyndham Hayward, the never tiring Secretary of the Society. We all owe him a very great debt of gratitude for all that he has accomplished for the advancement of the amaryllids.

—Hamilton P. Traub

A somewhat remarkable collection of hybrid amaryllis has been developed in the greenhouses of the Department of Horticulture, at the Illinois Agricultural Experiment Station, Urbana, Ill., under the general supervision of Dr. H. B. Dorner, Chief in Floriculture. Dr. Dorner writes that he has been growing *Amaryllis* for many years, but has not done anything special in the way of scientific breeding beyond the selection of choice seedlings from the best possible crosses. The collection had its foundation in a number of seedlings that were secured from E. G. Hill of Richmond, Ind., in 1913. "We feel that we have a very fine collection including whites, pinks, reds and maroons," Dr. Dorner adds.

A number of members of the Society are experimenting with color photography in their amaryllid studies. Some of the best work seen this year included a fine color print of an *Amaryllis* sent by S. Y. Caldwell, of Nashville, Tenn., and some Kodachrome pictures of various alstroemerias taken by H. L. Stinson in his gardens at Seattle, Wash. These last were very outstanding, and the huge clumps of bloom resemble azaleas in full flower, so very abundant are the colorful blossoms.

E. J. Anderson of Palm Beach, Florida, *Amaryllis* fancier who is believed to have been the first to bloom the "Blue *Amaryllis*", *A. procera*, in the United States, last February, mentioned in a letter that the photograph of the plant (Plate 190) that accompanied his article in this issue of *Herbertia* shows three flowers curled and wavy as to the petals, and a fourth normal and straight. This last was freshly opened, and the curled character is not assumed by the flowers until they have been open fully three or four days, according to Mr. Anderson.

The firm of Howard and Smith at Montebello, Calif., reports that unprecedentedly warm weather for the Los Angeles area drove thousands of city residents to the beaches last spring during the days of the National *Amaryllis* Show, and consequently reduced the attendance at this event far below expectations. The show itself, however, was well up to previous standards. The Howard and Smith firm, together with Cecil Houdyshel, W. E. Rice, W. M. James and others of the California members and active supporters of the Society, deserve the warmest commendation and praise from *Amaryllis* enthusiasts for their support of these California *Amaryllis* Shows, spring and fall, which have been made possible through their cooperation in recent years.

The new red daylily, *Mrs. John J. Tigert*, which was developed by the Florida Experiment Station, daylily breeding project, under the direction of Dr. H. Harold Hume and Prof. J. V. Watkins, will be released in limited quantity through commercial channels in late 1940. It is a "red" with more of the crimson color than any variety as yet well known in the trade.

The champion, long-distance record for moving and transplanting daylilies goes to ye Ed., Dr. Hamilton P. Traub, who took over 20,000

of his choicest seedlings with him from Orlando, Florida to the USDA Horticultural Station at Beltsville, Md., when he was transferred to the Washington area during summer of 1940. Dr. Traub is engaged officially in plant research projects for the United States Department of Agriculture. He reports that dry weather caused a loss of a few thousand seedlings but hopes for wonderful things from the "survival of the fittest".

W. E. Rice of Downey, Calif., sends a delightfully colored *Nerine* hybrid of his origination which arrived in Florida via air mail in perfect condition (the flower) and lasted a week or more in good shape, in a vase. The decorative possibilities of the amaryllids as cut flowers have scarcely been touched in America outside of the commoner sorts as *Narcissi* and hybrid amaryllis.

SECRETARY'S MESSAGE

Publication of the 1940 yearbook is a landmark in the efforts of the American Amaryllis Society to continue publication uninterruptedly in spite of discouraging world conditions in recent years. It bespeaks the loyal perseverance of the editor, officers and membership in upholding the ideal of faithful support for the advancement of the amaryllids.

The war in Europe has cut off a great part of the Society's contacts in other parts of the world, and has caused many members in other countries to turn necessarily from their studies of amaryllids and horticulture, as professionals and amateurs, to grimmer tasks. We may all pray in full earnestness that the situation may soon take a turn for the better to restore something like a normal intercourse between the nations.

Dr. Hamilton P. Traub has continued his diligent activities in behalf of the Society's work, as editor and director, spending long midnight hours in the supervision of manuscripts and illustrations as usual, and garnering from the far corners of the country his interesting and informative material. His eager zeal remains undimmed.

With four shows to its credit, and the present outstanding issue of *Herbertia*, your secretary points with pride to the record of the Society in this difficult year of 1940. The California spring and fall Amaryllis exhibitions, and the Amaryllis and Daylily shows held in Florida last spring, were events of exceptional horticultural importance on a nationwide scale. Their significance extends far beyond the narrow confines of the exhibition halls, and both directly and indirectly influences the appreciation of these magnificent flowers in the minds of thousands of receptive garden lovers who read and hear about the displays.

The secretary begs the membership to continue their loyal support of the Society in the usual way, and any additional financial aid would be most welcome and gratefully received, in these difficult times. Donations may be made for any specific purposes, as color plates for *Herbertia*, illustrations of Amaryllids, daylilies, special research projects, publications of monographs, establishment and maintenance of trial col-

lections, etc. The secretary asks all his many correspondents and co-operators to accept his sincere and heart-felt thanks for all their letters of friendly advice, suggestions and encouragement during the year past, as without them, the work of the Society would be dull indeed and probably much less worthy.

—Wyndham Hayward,
Secretary.

Lakemont Gardens,
Winter Park, Florida,
Nov. 1, 1940

NOTICE OF 1941 NOMINATIONS

To the members of the American Amaryllis Society:

As approved by Article 5, Section 1, of the By-Laws of the American Amaryllis Society, which specifies that the secretary shall send to all voting members, not less than 90 days before the date of the annual election, a list of the offices to be filled and the names of those whose terms expire, this information is hereby incorporated in the data below, and same will take the place of a mailed notice to the members to this effect for the 1941 election:—

President	Mr. E. G. Duckworth
Vice-Presidents	Mr. T. H. Everett
	Mr. E. A. McIlhenny
	Mr. Fred H. Howard
Secretary	Mr. Wyndham Hayward
Treasurer	Mr. R. W. Wheeler
Director-at-large for 3 years	Mr. Jan de Graaff

Article 7, Section 1 of the Constitution, provides that any voting member may submit to the Secretary, not less than sixty days before the annual meeting, nominations for officers and directors. These shall be submitted to a nominating committee, who shall select the candidates for the final ballot.

The Annual Meeting of the Society in 1941 will be held on the second Wednesday in April, as provided by Article 10, Section 1, of the Constitution, this being April 9, 1941. Therefore the names of nominees must be submitted by the voting members to the Secretary before February 10, 1941.

WYNDHAM HAYWARD,
Secretary.

October 1, 1940,
Winter Park, Florida.

The Secretary would like to take this opportunity of calling to the attention of members again the desirability of adding new members and enlarging the field of the Society by bringing it to the attention of horticulturists and garden lovers everywhere. The 1940 Year Book, we hope, will be considered a notable example of the Society's constant efforts to bring together the latest research, the newest accurate and useful information and interesting illustrations concerning the important amaryllis family. The income of your Society is used solely for the publishing of its Year Book, the holding of Amaryllis exhibitions, and generally supporting the other worthy aims of the organization.

DATA CARD FOR HEMEROCALLIS

When describing daylily clones, all breeders and growers are requested to use the Official Data Card for Hemerocallis, devised by the eminent artist and horticulturist, J. Marion Shull, and fully described elsewhere in this issue. These cards should not only be used in describing new clones but also for the description of all clones grown in the various climatic regions.

These cards are available at present in the 3 inch by 5 inch size at the nominal price of \$1.00 per hundred, to pay for printing, handling and postage. If the demand is sufficient, the same text will be printed in larger type on somewhat larger cards. Send orders to—

*Wyndham Hayward, Secretary,
Winter Park, Florida*

REPORT OF TRIAL COLLECTIONS COMMITTEE

The Trial Collections Committee reports the following accessions to the Society's collection of plants and bulbs since the 1939 yearbook report was published. A number of members of the committee having greenhouse facilities for the growth of tender plants and bulbs, and the United States Department of Agriculture are cooperating with the Society in this work at present.

Members are urged to remember the Society with trial lots of rare bulbs or seeds in its field when this may be possible.

A-279—Seeds of *Alstroemeria* species, from H. L. Stinson, Seattle, Wash.

A-280—Seeds of *Hymenocallis fragrans*, from Major Albert Pam, London, Eng.

A-281—Seeds of *Amaryllis rutila* var. *crocata* (?) mixed with hybrid *Amaryllis* seeds, from Karl J. Easton, Lake Worth, Florida, who received them from Sr. Joao Dierberger, Sao Paulo, Brazil.

A-282—bulbs of *Hymenocallis* species, from E. D. Aber, Jacksonville, Texas.

A-283—Seeds of *Amaryllis calyptrata* X *A. aulica*, from Major Albert Pam, London, Eng.

A-284—Seeds of *Zephyranthes* sp. collected by E. K. Balls (No. 4146) in Mexico (Pedregal) in 1938. Stems about 9-12 in. high, in cool house; flowers pale pink, found growing in partially shaded places under shelter of rocks in broken lava beds at 8,000 ft. altitude. Received from B. O. Mulligan, Asst. to the Director, Wisley Gardens, Royal Horticultural Society, England. Good germination obtained.

A-285—Seeds and small bulblets *Pancratium illyricum*, from Cecil Houdyshel, LaVerne, Calif.

A-286—Bulblets of *Haemanthus coccineus*, from Mrs. J. Norman Henry, Gladwyne, Penna.

A-287—Seeds of *Zephyranthes* sp. collected at Los Llanos, La Zanja, Argentina, from Dr. Alberto Castellanos, Buenos Aires, Arg.

A-288—Seeds and bulbs of *Zephyranthes* and other amaryllid species; collected at Ileal, near Alta, Argentina, from Dr. Alberto Castellanos, Buenos Aires, Argentina.

A-289—Seeds of *Pancratium illyricum*, *Amaryllis chilensis* and *Stenomesson flavum*, from Major Albert Pam, London, Eng.

A-290—Seeds and bulbs of *Zephyranthes* and other species, collected by R. A. Spegazzini “en los campos”, province of Corrientes, Mercedes, Argentina. From Jose F. Molfino, Buenos Aires, Argentina.

A-291—Seeds of *Nerine filifolia*, from Major Albert Pam, London, Eng.

A-292—Bulbs of *Phaedranassa Carmioli*, shipped by Austin Smith, Zarcero, Costa Rica, and released by United States Department of Agriculture.

A-293—Bulbs of *Leucojum aestivum*, type common in California gardens; also winter growing *Zephyranthes* sp. (No. 10211A), *Stenomesson* sp., (No. 401?) Vargas collection from Chile, being distributions from Goodspeed Andes expeditions, received from L. S. Hannibal, Concord, Calif.

A-294—Bulbs released by Division of Plant Exploration and Introduction, Bureau of Plant Industry, U. S. Dept. of Agriculture: P. I. No. 119708, *Ammocharis heterostyla*; P. I. No. 130551, *Habranthus robustus*; P. I. 118813, *Amaryllis aurica* var. *robusta*; P. I. No. 118442, *Amaryllis psittacine* var. *decorata*; P. I. No. 118440, *Amaryllis psittacina*; P. I. No. 118818, *Amaryllis rutila* var. *crocata*; P. I. No. 105304, *Nerine humilis*; P. I. No. 139133, *Stenomesson Pearcei*.

A-295—Tubers of *Alstroemeria* sp., including *A. braziliensis*, from H. L. Stinson, Seattle, Wash.

—Wyndham Hayward

Winter Park, Fla.,
Dec. 12, 1940.

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1940-41

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HERBERTIA



Vol. 8
1941

Shulz.



HERBERTIA

VOLUME 8

DAYLILY EDITION

EDITED BY

HAMILTON P. TRAUB

ORLANDO, FLORIDA

THE AMERICAN AMARYLLIS SOCIETY

1941

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AMERICAN AMARYLLIS SOCIETY

Printed in the United States of America

Published January, 1942



This volume contains a total of thirty-eight illustrations,
twenty-seven plates and eleven figures.

INTRODUCTION

The continuing program in Herbertia is satisfaction to all of us. The greater the difficulties in world affairs the more insistent is the need for courage in the daily life. There are abiding satisfactions in the growing of plants, that depend for existence on the land and the factors common to all mankind and are not disturbed by the conflicts of men.

Plants are endlessly diverse, and yet there are relationships among them that assemble the species into families and groups. It is good that persons can associate themselves particularly and personally with these families. The Amaryllids comprise an association of special interest because of similarity among themselves and yet great diversity, brilliant colors and commanding forms, and in many cases difficulties in handling that stimulate one's thoughtful endeavor. I have watched the progress of the American Amaryllis Society from the first and wish for it long life and many friends. We must maintain our interest in the growing of plants for the certain joy and confidence of the work.

—L. H. Bailey.

*Bailey Hortorium,
Sage Place, Ithaca, New York,
November 1, 1941.*

FOREWORD

In requesting this Foreword the editor of *Herbertia* stated that it "should be in the nature of a response from the pioneers to the younger breeders" of daylilies. The bequest of daylilies which the "pioneers" gave to horticulture is their best greetings to the "younger" breeders as well as to gardeners in general.

George Yeld in England (1892, *Apricot*, the first of his hybrids), Arthur Herrington in the United States (1899, *Florham*, his only daylily), R. Wallace and Co., in England (1900, *Luteola*; 1915, *Golden Bell*), and Willy Mueller with his uncle, Carl Ludwig Sprenger (1903, eight clones) are the early pioneers in breeding daylilies.

My own studies of the genus *Hemerocallis* began in 1912. Ten years were spent in assembling a collection of the known species and in obtaining, after several generations of selective breeding which involved 118 different progenies of hybrid seedlings, the seedlings of the first introductions. Then these were grown to full stature, compared, evaluated, and propagated over a period of five years before any of them (*Mikado*, *Wau-Bun*, and *Vesta*) were named in 1929.

At the New York Botanical Garden, the botanical and, may I say, the scientific aspects of the studies of this genus are of special concern. The horticultural selections are a by-product of the experimental studies on the extent, limits and nature of the changes in characters that appear after there has been successive hybridizations and subsequent selective breeding.

For the production of seedlings that were named previous to 1934 and not noted above there are records for the following persons:—

V. Lemoine et Fils: 1905, *Luteola Major*; 1906, *Luteola Pallens*; 1925, *Queen of May*.

Mr. Mueller, gardener at Strasbourg University: 1907, four clones reported.

Thomas Meehan: 1915, the "*Meehan Hybrids*", probably included the *Meehani Daylily*.

Dr. W. Van Fleet: the two clones, *Lovett's Lemon* and *Lovett's Orange*; probably originated about 1915 but dates of introduction are apparently not on record.

Luther Burbank: 1917, *Burbank*, *Calypso*, and *Surprise*; has also been credited with *Cygnets*.

Amos Perry: 1921, *Lady Hesketh*, the first of many introductions.

Bertrand Farr: 1924, *Ophir*, *Golconda* and *Mandarin*; 1926, *Citronella* and *Lemon Queen*.

Franklin B. Mead: 1924, credited with the production of *Hyperion*, which was first listed for sale in 1928.

Carl Betscher: 1928, *Lemona*, the first of many introductions.

Bristol Nurseries: 1930, *Dwarf Yellow*, which is not to be classed as dwarf.

H. P. Sass: 1930, *Golden West* and *Sunny West*, the first of his introductions.

Dr. H. Harold Hume: 1933, *Emily Hume*, a chance seedling.

Mrs. Thomas Nesmith: 1933, the first of her numerous introductions.

There are also about twenty-five horticultural clones presumably of hybrid seed origin that were named previous to 1934 for which there appear to be no authentic records of the originators.

As late as 1930, I visited George Yeld, Willy Mueller and Amos Perry and inspected their collections of daylilies. Actually, they had rather few daylilies; none of them had then grown many seedlings or engaged in more than incidental selective breeding after a first hybridization. But the first generations of the early hybrids were different from the parent species and were welcome additions to flower gardens. Some of these early introductions will no doubt long rate highly in the particular class to which each belongs. Mr. Yeld died in 1938. Mr. Mueller is, I believe, still proprietor of a horticultural garden in Naples but has not been especially concerned with daylilies for some years. Mr. Amos Perry, however, continues in the propagation and sale of a long list of daylilies and in the introduction of his own seedlings.

In 1934, I attempted to present in one small volume the information on the genus *Hemerocallis* which was deemed of most value and interest to botanists, gardeners, and the breeders of daylilies. In the seven years since that date there have been (1) contributions in publications to the botanical and horticultural knowledge of the genus, (2) a prolific multiplication of the "younger breeders" and in the number of horticultural clones that have appeared, and (3) a noteworthy increase in the appreciation of the values of daylilies for flower gardens.

There were 174 horticultural clones of daylilies in the list that was published in 1934. Today after only seven more years the number is perhaps three times as many. It is to be hoped that The American Amaryllis Society will formulate rules for the naming of new daylilies, provide for their registration, and each year publish the records for the new introductions.

Seven years ago the number of individuals and nursery firms that had contributed, even in a small degree, to the *actual development* of daylilies which had been introduced was certainly no more than twenty-five; and all of these of which I now have record are mentioned above. Today it seems from all reports that there may be several times that number of persons, including amateur breeders and nursery firms, who are growing seedlings. According to reports *many thousands* of seedlings have been grown in the United States in recent years. There is much merit in growing large numbers of seedlings, especially if they have for their parents plants that were produced by multiple hybridizations and selective breeding. There is greater chance for the rare recombinations of recessive hereditary factors and the new combination of complementary factors which are responsible for the expression of certain characters. There are increased chances for mutations, as, for example, a definitely pure white flower of which, I believe, none now exists in *Hemerocallis*.

But even a casual survey of the horticultural introductions of daylilies of the past few years shows that too many mediocre daylilies are being introduced. Many of these "new" daylilies closely resemble others already in the trade. There is sometimes a hurried introduction of seedlings that have not been carefully compared, tested and evaluated, or grown to mature stature, or propagated. It is obvious and imperative that the "younger" breeders produce better daylilies in the classes already developed by the "pioneers" and also that they produce distinctly new classes. A daylily that is merely good is no longer good enough.

In the evaluation of daylilies for garden culture in different parts of the United States it must be recognized that no horticultural clone or species can be expected to thrive equally well everywhere. Many with evergreen habits of growth are tender in the North; at least some of those that are dormant in winter will not live in the South. Breeders in different parts of the United States have the opportunity to engage in selective breeding to develop the different classes of flower color and form in vegetative habits best suited to the particular area.

It seems that at the present time most gardeners evaluate daylilies chiefly on the basis of their own individual preferences in respect to color of flowers. But to say that *Patricia* is better than *Theron* is only to say that among daylilies one prefers blondes to brunettes. There is no *one* best daylily. There are and will be best daylilies for each of the respective classes which are already somewhat defined especially in foliage habits and color-patterns. Also the value of any rating of daylilies depends on what particular clones happened to be involved in the comparison.

In the minds of many gardeners, horticulturists, botanists and "younger breeders" the daylilies are in a stage of infancy. But surely in the understanding of many readers of *Herbertia* the daylilies are at least in some stage of adolescence. Anyhow, the writer will rate the daylilies themselves no more advanced than adolescent; and this evaluation is made in a contemplation of what I believe their own future can be.

—A. B. Stout.

*The New York Botanical Garden,
Bronx Park, New York City,
November 26, 1941.*

PREFACE

In these troublous times we should take to heart the introductory words of Dr. Bailey, the Dean of American Horticulture. We need to relax now more than ever before in order to be ready for the urgent tasks before us.

We are grateful for the inspiring Foreword by Dr. Stout of the New York Botanical Garden. He writes from long experience with daylilies, and his remarks will be of especial value to those who are just beginning daylily breeding.

Before proceeding further we must acknowledge the splendid heroism of the British. In spite of unprecedented hardships they retain a first rate morale, and possess a real sense of proportion which makes it possible for them to relax in their gardens on occasion to appreciate the beautiful things of life. It is natural therefore that we have some excellent contributions from Britain in this Edition that is dedicated by the younger daylily breeders to the pioneers in this field. We are indebted to Mr. Baker for the Memoir of George Yeld, the great Englishman whose unselfish life will remain an inspiration to all future generations. He was the first daylily breeder, and when we consider that he did not have *Hemerocallis fulva* var. *rosea* to work with, we must admit that he made real progress in daylily breeding.

The autobiography of Amos Perry fills a long felt want, and his success with daylilies is shown by the reports of his outstanding daylily display at one of the Royal Horticultural Society shows this year.

For the autobiography of Dr. Stout the reader is referred to Volume 5, *HERBERTIA*, 1939. It was published on the occasion of the award of the William Herbert Medal to him for his achievements in daylily breeding.

We welcome the kindly Hans Sass and the thorough Paul Cook, who have made important contributions toward the advancement of the daylily.

Mr. Shull presents some real contributions on the policy for trial gardens, daylily descriptions, inheritance in daylilies, propagation habit and the initiation of the inflorescence. Prof. Watkins of the University of Florida gives us the first comprehensive evaluation of the daylily for Northern Florida on the basis of the official score card. This is indeed a landmark. The reader will see at once that when this procedure is followed it will be possible to single out the best and discard the inferior. *The superior clones may then be classified in various ways by color classes, flowering season, foliage habit, etc.* We also are indebted to Prof. Watkins for important articles on sequence of flowering in daylilies, description of clones, and the use of daylilies in garden design.

Mr. Claar, the Chairman of the Daylily Committee, again presents very interesting reports on visits to daylily breeders in various parts of the country. Such comparative pictures are urgently needed and he is to be congratulated on his kindly and understanding personality that fits him ideally as the official ambassador of good will in the daylily field.

There are other important daylily articles by the younger breeders, and the whole array of daylily material presents the first comprehensive

symposium on the daylily. Others are to follow in future issues of HERBERTIA.

Although this issue is dedicated to the daylily, other amaryllids are not neglected for it is the editorial policy to further the advancement of all of the amaryllids. This Society is unique in that it attempts to give to the member a unified view of an entire plant family. The obvious advantage is that this plan provides an almost inexhaustible mine of interesting subjects for the amateur, and gives him an opportunity to secure experience with phylogenetic relationships among plants. However, the rich variety of material makes it necessary to classify the subject matter under the heads, (a) description, classification, and phylogeny, (b) cytology, genetics and breeding, (c) propagation, (d) culture; and still other convenient heads. The plantsman, who is really interested in growing things does not mind this. What really matters is to get the maximum amount of material published.

Mr. James writes about *Haemanthus Katherinae*, *Nothoscordum fragrans*, and the time of flower formation and chromosome numbers in *Nerine* (in collaboration with Dr. Addicott). It is fitting that the Herbert Medal for 1941 is awarded to him for his outstanding contributions toward the advancement of the amaryllids. His autobiography will be read with interest by all.

There are also reports of amaryllid shows, color photography, several important articles on *Narcissus*, including the fundamental research of Dr. Grainger of the Tolson Memorial Museum, Ravensknowle, England; the propagation of amaryllids by Mr. Close of the U. S. Department of Agriculture; hardiness of amaryllids by Mr. Fernald, and a wealth of other important articles.

Mr. Hannibal's contributions include an excellent one on "Stinson and his Alstroemerias", and this may be taken as a foreword to the 1942 issue that will be dedicated to the Alstroemerids.

We must acknowledge a debt of gratitude to Major Albert Pam, O. B. E., of Wormley Bury, Broxbourne, Herts., England, one of the Society's staunchest friends, who has assisted materially in making this daylily Edition complete. It was through his help that the articles from England arrived on time for inclusion in this issue. In the 1942 issue, we will be favored with an important article from Major Pam in the nature of a check list of amaryllids described and pictured in color in botanical works published from the end of the 18th. century to about the middle of the 19th. century. We had hoped to include it in this issue, but it did not arrive in time.

We have word from our good friend, Colonel Russell S. Wolfe, of Orangeburg, South Carolina, informing us that he has been called to active military duty.

We know that he will greatly miss his plants, but as pointed out in the introduction to the Buyers' Guide that he contributes, he knows that our American values are worth defending, and he is glad of the opportunity.

[PREFACE—Continued on page 13.]

TABLE OF CONTENTS

	PAGE
Daylily Edition Cover Design, J. Marion Shull	
Introduction, L. H. Bailey	3
Foreword, A. B. Stout	4
Preface	7
Instructions for contributors	13
Errata—1940 <i>Herbertia</i>	13
Dedication	14
George Yeld—A Memoir, G. P. Baker	15
Amos Perry, F. L. S., V. M. H., an autobiography	19
Bertrand H. Farr	27
Hans Peter Sass, an autobiography	28
Paul Howard Cook, an autobiography	30
Herbert Medalist—W. M. James, H. P. Traub	33
Wilfred MacDonald James, an autobiographical sketch	33
Hubert Fisher, Sr.—In Memoriam	35
In Memoriam—Sir Arthur William Hill	35
Some Daylily Problems, J. Marion Shull	36
Bombing <i>Amaryllids</i> , excerpts from Maj. Pam letter	39
<i>Amaryllid</i> Musings, W. M. James	40
The Daylily Edition Cover Design	43

1. REGIONAL ACTIVITY AND EXHIBITIONS

Second National Daylily Show, Orlando, Fla., 1941, Wyndham Hayward	45
The Daylily Comes of Age in Britain—Perry Exhibit at R. H. S. Show, 1941	47
National <i>Amaryllis</i> Show, Orlando, Fla., 1941, Wyndham Hayward	49
Visits to Midland Gardens, Hamilton P. Traub	50
Autumn <i>Amaryllis</i> Show, Pomona, Calif., 1941, Cecil Houdyshel	51

2. COLOR DESCRIPTION

Color Photography and the <i>Amaryllids</i> , Wyndham Hayward	53
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3. DESCRIPTION, CLASSIFICATION AND PHYLOGENY

Visits to Gardens of Daylily Enthusiasts, Elmer A. Claar	55
Random Observations and Descriptions of Daylilies, J. Marion Shull	60
Some Daylilies I Like, David F. Hall	64
Memorandum on a Monograph of the Genus <i>Hemerocallis</i> , A. B. Stout	69
Evaluation of Daylilies for Northern Florida, John V. Watkins	71
Evaluation of Daylilies for Central Florida, H. P. Traub and W. Hayward	74
Daylily Musings and 1941 Experimental Poll, Elmer A. Claar	76
Seed Character of <i>Amaryllis procera</i> , H. P. Traub	82
Wayman Daylilies	82

Registration of New Clones—

	PAGE
Hybrid Daylilies	83
Hybrid Amaryllis	91
Hybrid Habranthus	92
Agryopsis Clones	92

4. CYTOLOGY, GENETICS AND BREEDING

Inheritance in Daylilies, J. Marion Shull	93
Report on Inter-specific hybridizations in <i>Hemerocallis</i> , A. B. Stout	95
Breeding for Good Red Daylilies, Wyndham Hayward	103

Daylily Breeding Roundup—

Producing New Daylilies, J. B. S. Norton	105
Aims in Daylily Breeding, C. W. Culpepper	106
Daylily Breeding and Testing at Craemore, L. Ernest Plouf	107
My Interest in <i>Hemerocallis</i> , M. B. Matlack	109
Daylilies in Jacksonville, Florida, Mrs. W. E. MacArthur	110

Preliminary Report on Time of Flower Formation and Chromosome Numbers in <i>Nerine</i> , W. M. James and F. T. Addicott	111
Notes on <i>Narcissus</i> Breeding and Culture, L. S. Hannibal	116
Mrs. Rowntree on Californian and Mexican Wild Flowers	120

5. PHYSIOLOGY OF REPRODUCTION

Some Experiences in Daylily Propagation, J. S. Cooley	121
Easy Germination of Seeds of <i>Amaryllidaceae</i> in <i>Sphagnum</i> Moss, Albert W. Close	122

6. CULTURE

Daylilies in California, Donald B. Milliken	125
Initiation of Inflorescence in Daylilies, J. Marion Shull	126
Flowering Sequence of Daylilies in Florida, John V. Watkins	129
The Variegated Daylily in Florida, John V. Watkins	131
Daylilies in Garden Design, John V. Watkins	132
Why I am Interested in Daylilies—1941 Revision, Elmer A. Claar	133
Food Manufacture and Flowering in the Daffodil, John Grainger	134
Culture of <i>Narcissus serotinus</i> , Drew Sherrard	145
Notes on Hardiness of <i>Amaryllids</i> , Benjamin G. Fernald	147
The Desert Lily, <i>Hesperocallis undulata</i> , Mrs. Lester Rowntree	149
The Star Lily, <i>Leucocrinum montanum</i> , Mrs. Kathleen N. Marriage	152
Propagation of <i>Clivias</i> by Leaf Cuttings, V. T��ran	152
<i>Nothoscordum inodorum</i> , W. M. James	156
<i>Haemanthus Katherinae</i> , W. M. James	156
Early Records of <i>Amaryllids</i> in California, H. M. Butterfield	159

	PAGE
Stinson and his Alstroemerias, L. H. Hannibal	161
Amaryllids in Palm Beach Gardens, Karl J. Easton	164
Hardy Amaryllis, H. P. Traub	166
Crinum scabrum, Wyndham Hayward	168

7. THE SOCIETY’S PROGRESS

Secretary’s Mail Bag	169
Secretary’s Message	172
Report of Trial Collections Committee	173
Notice of 1942 Nominations	174
Officers and Committees	175
Publications of the Society	177
Data Card for Hemerocallis	178

THE BUYERS’ GUIDE

Preserve the Beautiful Things of Life, Russell S. Wolfe	179
Announcement—Amaryllidaceae, First Edition	180
Advertisements	181

LIST OF ILLUSTRATIONS — PLATES

Plate 198 Frontispiece Portrait—George Yeld, 1845-1938	facing page 15
Plate 199 Portrait—Amos Perry	21
Plate 200 Perry daylily nursery, seedlings, 1941	22
Plate 201 Perry daylily nursery, selected seedlings	24
Plate 202 Bomb crater, Perry Nursery	26
Plate 203 Herbert Medalist—Wilfred MacDonald James	32
Plate 204 Bulbs of Nerine Bowdeni and Haemanthus Katherinae, offsets	42
Plate 205 Perry Daylily Exhibit, R. H. S. Show, 1941	44
Plate 206 Hemerocallis flava; plate from Stout monograph	67
Plate 207 Hemerocallis Middendorffii; plate from Stout monograph	68
Plate 208 Hemerocallis fulva types; plate from Stout monograph	70
Plate 209 Swan and Kanauaha daylilies	84
Plate 210 Inheritance in daylilies; Gorgio and Gipsy Lass	94
Plate 211 Greenhouse scene, N. Y. Bot. Gard., daylily work	99
Plate 212 Daylily breeding plots, N. Y. Bot. Garden	100
Plate 213 Use of sphagnum moss in amaryllid propagation	123
Plate 214 Flower bud initiation in Hemerocallis	128
Plate 215 Flowering sequence of daylilies at University of Florida	130
Plate 216-A Distribution of dry weight in Narcissus	136
Plate 216-B Development of flower bud, and of flowering in Narcissus	136
Plate 216-C Seasonal distribution of carbohydrate and nitrogen in Narcissus bulb	137

Plate 216-D Meterological data relating to growth of <i>Narcissus</i> bulb	137
Plate 217 Seasonal distribution of carbohydrates in <i>Narcissus</i> leaves	142
Plate 218 <i>Narcissus serotinus</i>	146
Plate 219 The Desert Lily, <i>Hesperocallis undulata</i>	150
Plate 220 The Star Lily, <i>Leucocrinum montanum</i>	153
Plate 221 <i>Nothoscordum inodorum</i> ; mother bulbs and bulblets	154
Plate 222 Clump of <i>Nothoscordum inodorum</i>	155
Plate 223 <i>Haemanthus Katherinae</i> ; flowers viewed from above	157
Plate 224 <i>Haemanthus Katherinae</i> ; close up of fruits, flowers and leaves	187

FIGURES

Figure 59 George Yeld in his garden	16
Figure 60 George Yeld and Amos Perry, 1934	20
Figure 61 Portrait—Hans Peter Sass	29
Figure 62 Portrait—Paul Howard Cook	30
Figure 63 <i>Crinum</i> species from Southwest Africa	41
Figure 64 Seed character of <i>Amaryllis procera</i>	82
Figure 65 Dissected <i>Nerine</i> bulbs showing next year's inflorescence	112
Figure 66 Chromosomes of three <i>Nerine</i> species	114
Figure 67 Use of daylilies in landscape design	132
Figure 68 Daily fluctuation of carbohydrate in <i>Narcissus</i>	141
Figure 69 <i>Crinum scabrum</i>	168

ERRATA

HERBERTIA, VOL. 7, 1940

Pages 15 and 16; for "Ladislav" where it appears read "Ladislao".

Page 42; 6th. line from top, for "*auluca*" read "*aulica*".

Page 83; 11th. line from bottom, for "INDORUM" read "INODORUM"; and for "Dist." read "Dict.".

INSTRUCTIONS FOR CONTRIBUTORS

YEAR BOOK CORRESPONDENCE. Correspondence regarding articles and illustrations for *Herbertia*, the Year Book of the American Amaryllis Society, is cordially invited. The annual news-letter or articles from Corresponding Members and Regional Chairmen of Trial Collections should be forwarded, if at all possible, by April of each year, or earlier, depending upon the distance, so as to reach the editor in ample time for publication. Copies of manuscripts should be retained by the authors as an insurance against loss in the mails.

MANUSCRIPTS should be *typewritten* if at all possible and *double spaced*; photographs should have the *name of the owner* to whom credit should be given, and the *name and size of the subject*, written on the back.

PHOTOGRAPHS. When making photographs of amaryllids, an effort should be made to include the whole plant—*stem*, if any, *leaves*, *scape* and *flowers*. Separate photographs of the *bulb* and *roots* are also valuable in some cases. These remarks do not apply to cut-flowers.

[PREFACE—Continued from page 8.]

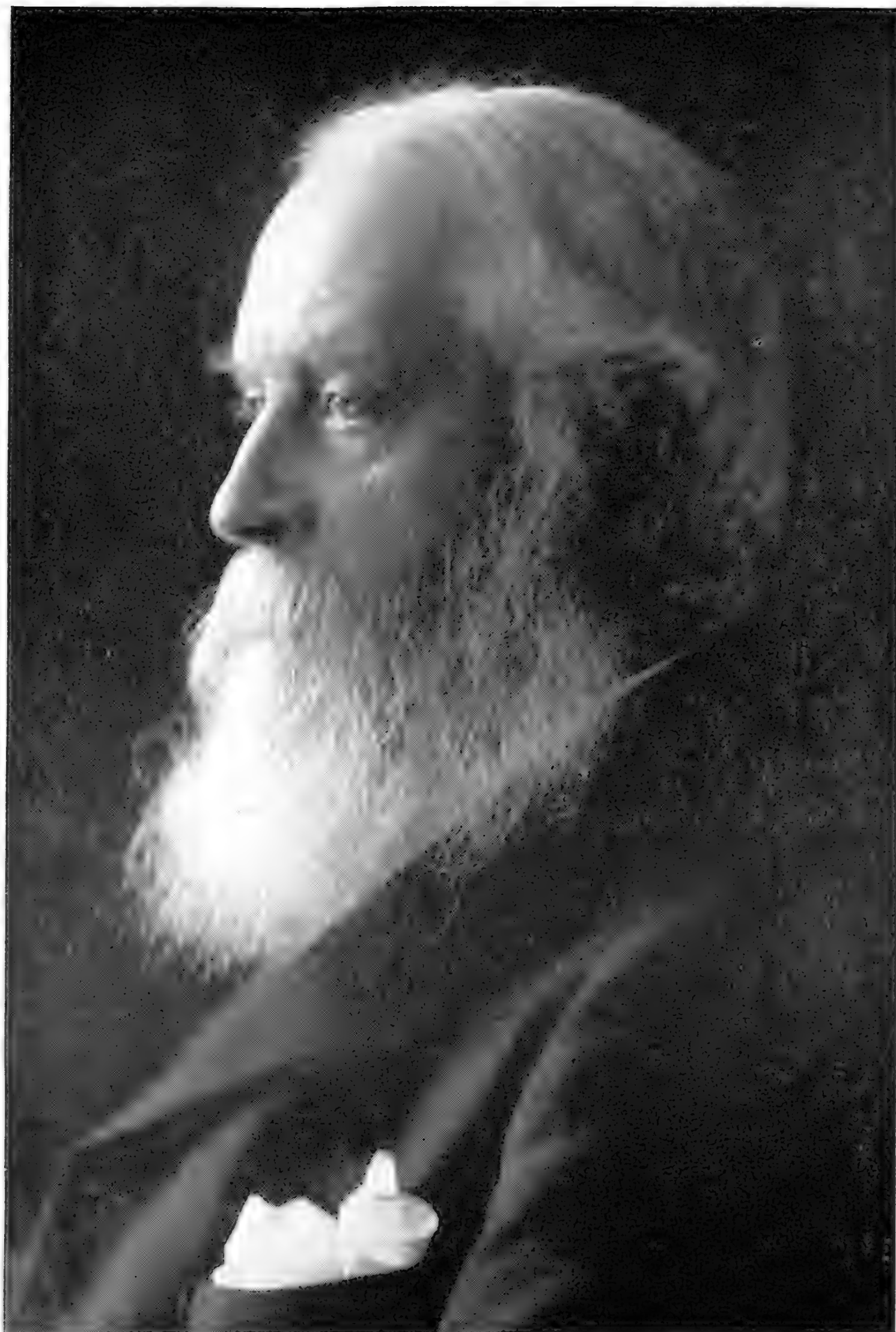
We have word from Major E. Milne-Redhead, whom we met at Kew in the fall of 1938, informing us that he is on military duty somewhere in West Africa. He kindly remembered the Society with seeds of a native *Crinum* species.

Last but not least it should be noted that daylily test gardens have been established at Cornell University, Ithaca, N. Y., Southwestern Louisiana Institute, Lafayette, La., and at Whitnall Park Arboretum, Milwaukee, Wisc., County Park System. Breeders should send their introductions to these gardens for impartial evaluation.

Beltsville, Maryland,
December 3, 1941.

—*Hamilton P. Traub*

*This volume of Herbertia
is dedicated, by the younger daylily breeders,
to the pioneers in the field of daylily breeding,
particularly to the late George Yeld,
the first person to hybridize daylilies;
the late Arthur Herrington, the late Karl Ludwig Sprenger,
the late Dr. W. Van Fleet, the late Luther Burbank,
the late B. H. Farr, the late Franklin B. Mead,
V. Lemoine et Fils, R. Wallace & Co., Ltd., Barr & Sons,
Willy Mueller, Dr. A. B. Stout, Amos Perry,
Carl Betscher, H. P. Sass, Paul H. Cook.*



George Yeld, 1845-1938

GEORGE YELD—A MEMOIR

G. P. BAKER, *V. M. H.*

George Yeld who passed away in 1938 at the great age of 93 full of years and honour, was a remarkable man, of a type of Englishman of the classical school. (See Plate 198.)

He received his early education at Hereford Cathedral School, passing out as head boy to enter Brazenose College, Oxford, as a scholar. Here he won the great distinction in 1866 of gaining the Newdigate Prize for English verse, thus following in the footsteps of Tennyson, Southey, and Matthew Arnold. In after years, Yeld reminded one with pleasure of Matthew Arnold's kindness to him on many occasions, and not least on the day when he received the prize, for it was Matthew Arnold's privilege to make the public oration at that event.

He was destined by his Father for the law, but the instinctive leanings derived from his Mother's family towards the profession of teaching were made manifest at the beginning of his career, for soon after he had taken his degree in 1867 he went to one of our public schools, St. Peters, York. He remained on the staff there for the unprecedented period of fifty-two years, preferring, all the time, to be responsible for the teaching of the fourth form boys, for he recognized that it was amongst the junior boys that good, sound, early grounding would be the making of their careers.

He became so closely identified with the School that in the minds of many pupils who passed through his hands, it might have been said that he was the school. Headmasters might come and go, but Yeld stayed on and upheld the traditions of the School. On the completion of fifty years of service, past and present pupils presented him with a purse, and his portrait in oils to the School. The devotion of the Old Boys was admirably expressed in what had been written by those who had responded to the invitation to subscribe to the memento which was to reveal itself on St. Peter's Day. "Dear Old Yeld," they had said, "if ever there was an English gentleman training in a school it was dear old Yeld, and we will do what we can to see that the aftermath of his life is lived in affluence and peace."

In the 80's and 90's Yeld was responsible at St. Peters for the school-play, generally a comedy of Shakespeare, for which he used to write the Prologue or Epilogue in verse. Full of keenness about all he took an interest in, whether teaching, books or games; he did everything with the unfailing love of boys that made him the true schoolmaster.

He had a wonderful memory for names and faces, and it was said that on school festival days, when the old boys returned to the playing fields of their youth, he was rarely at fault in recognizing former pupils, some of whom he had not seen for a decade. With remarkable ease, the veteran master could run over the names of a hundred old Peterites, who had attained great positions in the Church, the scholastic profession, medicine, law, the Army and Navy, the Civil Service, the World of Sport

and in many other walks of life. But Yeld was more than a schoolmaster; together with his duties at St. Peters, he had other and wider interests. It was at Oxford that he got his first zest for climbing. Arnold wrote of "the cheerful silence of the fells," and these and their loftier companions, the mountains, had been to Yeld, a rich source of inspiration, upon which those who have sat at his feet have drawn freely. The unbeaten tracts of the Lake Country fells, the ranges of the Welsh mountains, the glassy peaks of the Swiss Alps, and the crags of the Eastern



Fig. 59. The late George Yeld in his garden; photograph sent to Dr. A. B. Stout by Mr. Yeld in 1934.

Caucasus were to him as an open book. As a mountaineer, he was in the front rank; he yearly visited the Swiss or Italian Alps, and became so knowledgeable on the mountains of the world, that he was induced to take on the editorship of the Alpine Club Journal, a post he held for thirty years. In games he was no mean cricketer and played for the Yorkshire gentlemen. In horticulture he became very active and intensely enthusiastic, as I shall mention later on. Up to the last he daily read his Homer and attributed this fondness to the classical learning of his youth. He enjoyed the beauty of the classics, for a knowledge of these.

he used to say, opens the door to intellectual society in which the culture of a gentleman rested.

Over a period of more than half a century Yeld was my oldest and most valued friend. I first met him in the Welsh hills and finding that we were destined for the same Inn, he soon found out who I was, and asked if I contributed the article in the *Alpine Journal* on the ascent of Mt. Ararat. On reaching the Inn he was given the room which he had ordered, but I was told I could not be accommodated. Whereupon Yeld turned to the Manager and asked if a bed for me could not be placed in his room. This then was my first acquaintance with this dear good man. The next year he invited me to join him in the Italian Alps. We had on that occasion two guides, and put in some good work, making several new ascents, which eventually qualified me for membership of the Alpine Club. Later we climbed together in Wales, Skye, the Alps of Switzerland and the Eastern Caucasus.

Yeld was the author of "Scrambles in the Eastern Graian Alps" and honorary member of all the leading mountaineering clubs of the world. He was a man of a nature entirely unselfish, pure and lofty, I have never known him to say intentionally an unkind word of a single human being.

In our gardens I can recall many pleasant hours spent in Yeld's company and owe to him more than I can say for his guidance in horticultural problems. (See Figure 59.) He was a good all-round gardener and specialised in raising and hybridising Irises and *Hemerocallis*, adding to the beauty of our gardens many new plants, and for this and other work he was awarded in 1925 the Victoria Medal of Honour of the Royal Horticultural Society. He was one of the founders of the Iris Society and its first President. Of the many Irises which he raised only a few were introduced, and of these the best were *Lord of June*, *Asia* and *Sir Michael*, and all three received the A.M. of the Horticultural Society. This last he was satisfied was worthy to represent Sir Michael Foster in floral memory.

But it is of his work on Day Lilies that I wish to write in this memoir. He and I had intended in 1925 to publish a booklet on the genus and its hybrids—but for some reason this intention was never realised. Yeld did, however, prepare a preface, of which the following extract on the garden merits of the Genus is perhaps worth quoting:

"Strange as it may seem, horticulture has become so popular that difficulty in growing a plant well is almost a recommendation in itself among enthusiastic gardeners; and yet, no doubt, there are still cultivators who are thankful to come across a bright-coloured fragrant bloom whose good nature, if not a liberal education, is yet redolent of a generous kindness. Such an one is the *Hemerocallis*. Easy to grow, easy to please, easy to see across the garden, easy to distinguish by its scent and easy to divide if you are fain to share its delights with a friend, and what true gardener fails to feel the impulse to share his treasures with his cronies, though not without a proper regard for the interests of his friends, the nurserymen?"

George Yeld began to hybridize *Hemerocallis* at Clifton Cottage, York, in 1877 with only *H. flava* and *H. fulva*; later he obtained *H. Middendorffii*, *H. Dumortieri*, and *H. graminea*. The first hybrid of *H. flava* X *H. Middendorffii* was *Apricot* which received an A.M. in 1893.

After this came crosses with *H. aurantiaca major*, which pollinated with *H. flava* produced *Corona*, A.M. 1905. He later used *H. aurantiaca* which flowered and set seed in the open which the *major* form refused to do, and this crossed with *H. Middendorffii* gave him "a nice open flower called *Aurelia*."

He then used *H. Thunbergii* (= *H. serotina*) on which to place pollen from other species and varieties; the best of the offspring was his last seedling from this parent, *Radiant*, which received an A.M. 1925. Among other varieties raised by him which he admired were *Moidore* (*flava* X *nana*), *Winsome* (1925), *Amber* (1930), *J. S. Gayner* (1931), *Sirius* (1931), *Pyrrha* and *Gramercy*, and also *Bretwalda* (1934) a golden flower, flower stalk over 3 feet; and *Sayda*, orange, both of which he highly recommended, and *Magnifico* (1935).

Yeld, who was married twice, died at Orleton, Gerrards Cross, Buckinghamshire, in a house belonging to his son Dick.

ADDENDA

[In response to our request for certain additional data about the late George Yeld, and a short biography of the author of the Memoir on George Yeld, Mr. G. P. Baker furnished the notes given below, received after the rest of this issue of HERBERTIA was in print.—H. P. Traub]

Yeld was born March 23rd, 1845 and died April 2nd, 1938. His Newdigate Prize poem was called "Virgil reading the Aeneid to Augustus and Octavia".

As to myself—I was born in Constantinople Feb. 16th, 1856. It was Yeld who about 1881 led me on the Iris track—He became the first President of English Iris Society and I the second. I have done a good deal as a hybridist—especially have I tried to master the cultivation of the onco-cyclus Iris of Palestine and some years ago in 1929 with Hiatt Baker we went to Palestine and ran to earth the various varieties to learn the soils and conditions under which they grow. The result of the investigation was published in the Iris Year Book 1930. My second love was amongst Alpines and when I gave up serious climbing, I took to plant hunting amongst mountains, Alps, Turkey, Pyrenees, Atlas, Crete, Lebanon, Olympus, Greece, Rif—when Sir William Lawrence died the committee of the Alpine Garden Society insisted on my being President.

As to when I was made a V. M. H., I cannot tell without having to wade through several years of R. H. S. Journals now in the box room. I do, however, remember the President of the R. H. S. in presenting it to me, saying that I had not only discovered good and new plants, but I had also distributed them.

Three years in succession I have spent from 5 to 6 weeks each year in the hills, in Crete, with tents, cook, interpreter and mules. Good things were found and the story told in the R. H. S. Journal and in Botanical Magazine—a new tulip which Sir Daniel Hall has named *Tulipa Bakeri*. In the Atlas Mountains a new *Narcissus*, *N. Watieri* was discovered—It is figured in the Botanical Magazine—so also a Paeony from Crete. In the Rif Mountains there is another *Narcissus* species which will come to light very soon.

In the Alpine Garden Society Bulletin I contributed and illustrated an article on Small Bulbous Irises, following a very useful book by Sir Michael Foster and published by the R. H. S., now out of print.

I think I have said enough, and if Dr. Traub knows Mrs. Ethel Peckham, of the American Iris Society, she knows something of my doings.

If I had to start life again, in horticulture, it would be amongst flowering shrubs.

—G. P. BAKER.

AMOS PERRY, F.L.S., V.M.H.

AN AUTOBIOGRAPHY

From early boyhood I knew that horticulture was to be my vocation. The love of flowers was an inherent trait which could not be mastered and I have never felt the slightest urge to adopt any other calling. Consequently, after leaving Tottenham Grammar School my father had me apprenticed to T. S. Ware of Hale Farm Nursery, Tottenham—at that time one of the largest general nurseries in the country. Here I worked through the several departments and on completion of apprenticeship was appointed foreman to the Bulb Department. There it was that the joys and trials of growing miscellaneous rare bulbs and tubers first revealed themselves and created an interest which has never disappeared, indeed, even today I believe myself justified in claiming that my collection of these interesting subjects is one of the most complete trade collections in the country.

At this time I frequently visited Covent Garden Market and in this way met and ultimately became the best of friends with the late Mr. George Beckwith, the great carnation specialist. On his inducement I decided to leave Ware's and start in business on my own account as a carnation grower. My late father joined me and we secured 4 acres of land at Winchmore Hill and procured from Beckwith, during the early spring of 1890, 1,500 large forced plants of border carnations, old plants 5/6 ft. high in many cases with two and more hundred layers. This consignment included some 200 plants of Mrs. Frank Watts (named after the wife of one of the pioneers of the bulb growing industry in the Scilly Isles), a variety which was in great demand and considered by the market men of that day as the finest white carnation ever introduced. It was our original intention to grow carnations for the wholesale trade and we did secure the attentions of most of the larger buyers; but, after a while interest palled.

Meantime, however, we were gradually acquiring a collection of miscellaneous bulbs and rare perennials from such men as the late Max Leichtlin of Baden Baden, Louis Van Houtte of Ghent, De Graaff of Holland and Dr. Regel of St. Petersburg, a famous gardener then in control of the finest collection of plants in Europe whose friendship continued until his lamented death. About this time my father had secured a very large consignment of many thousands of plants from the Chilean Andes which had been collected by a French political refugee; this consignment included many thousands of *Placea ornata*, *Stenomessons*, and a large quantity of *Tecophilea cyanocrocus* and *T. cyanocrocus* var. *Leichtlini*; we were able to sell these extremely rare plants @ 30/-per 100 and at the same time clear a very handsome profit.

I well recall visiting Mr. De Graaf and finding several deep purple forms amongst a magnificent batch of *Delphinium cardinalis* seedlings. On witnessing my enthusiasm, my host remarked "You shall have the coloured forms—they are of no use to me. I can only sell the scarlet." It was in these gardens too that our original collection of *Helleborus*

orientalis originated; these "harbingers of spring" that seem at long last to be receiving the popularity they so richly deserve.

The plants so acquired became the nucleus of our present collection: I started hybridising and searching for variations in the heterogeneous forms of the type species.

In 1890 whilst on a visit to York I met that "Grand Old Man" of *Hemerocallis* fame, the late Mr. George Yeld, and our friendship continued till the time of his death. It was his enthusiasm and encouragement that was so helpful to me in those days of long ago and in later years enabled me to follow more closely his advice and do my share in making this genus better known. At that time I promised to visit his garden again but notwithstanding his many pressing invitations I never had an opportunity of keeping my promise till 1936 (See Figure 60.);

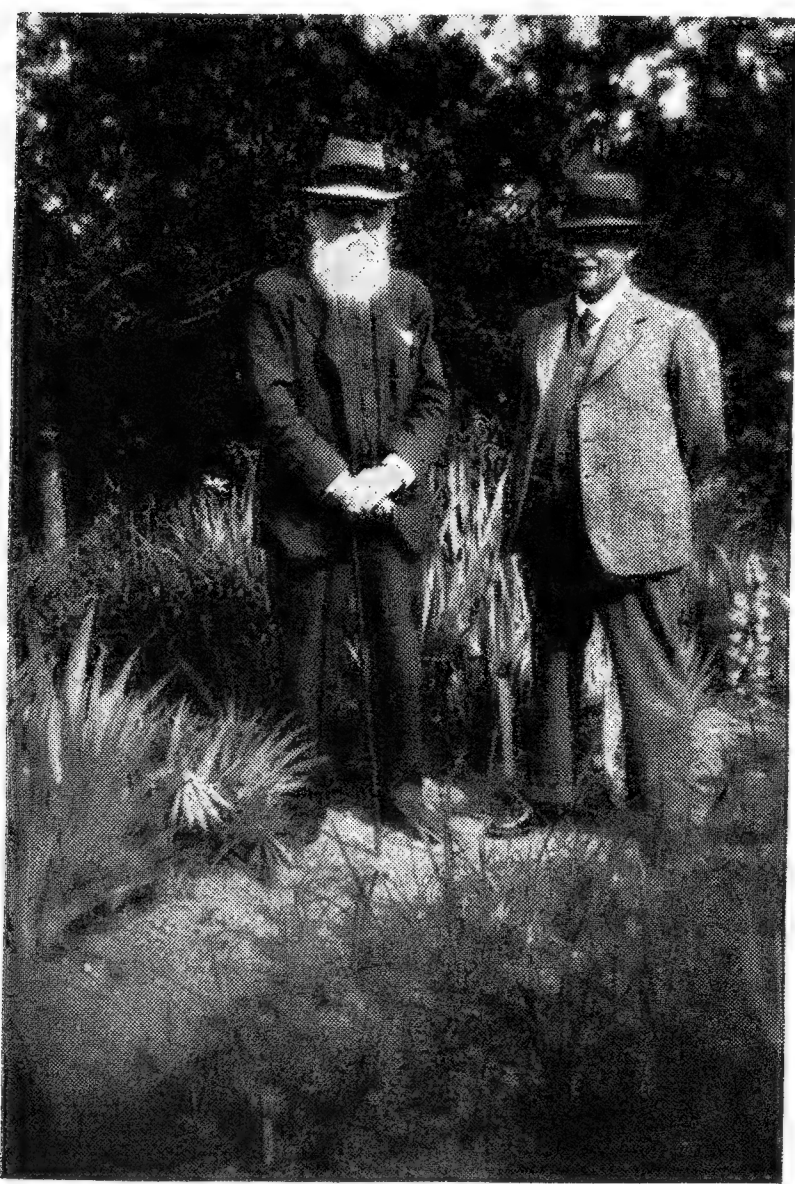


Fig. 60. George Yeld and Amos Perry in Yeld's garden in 1936.

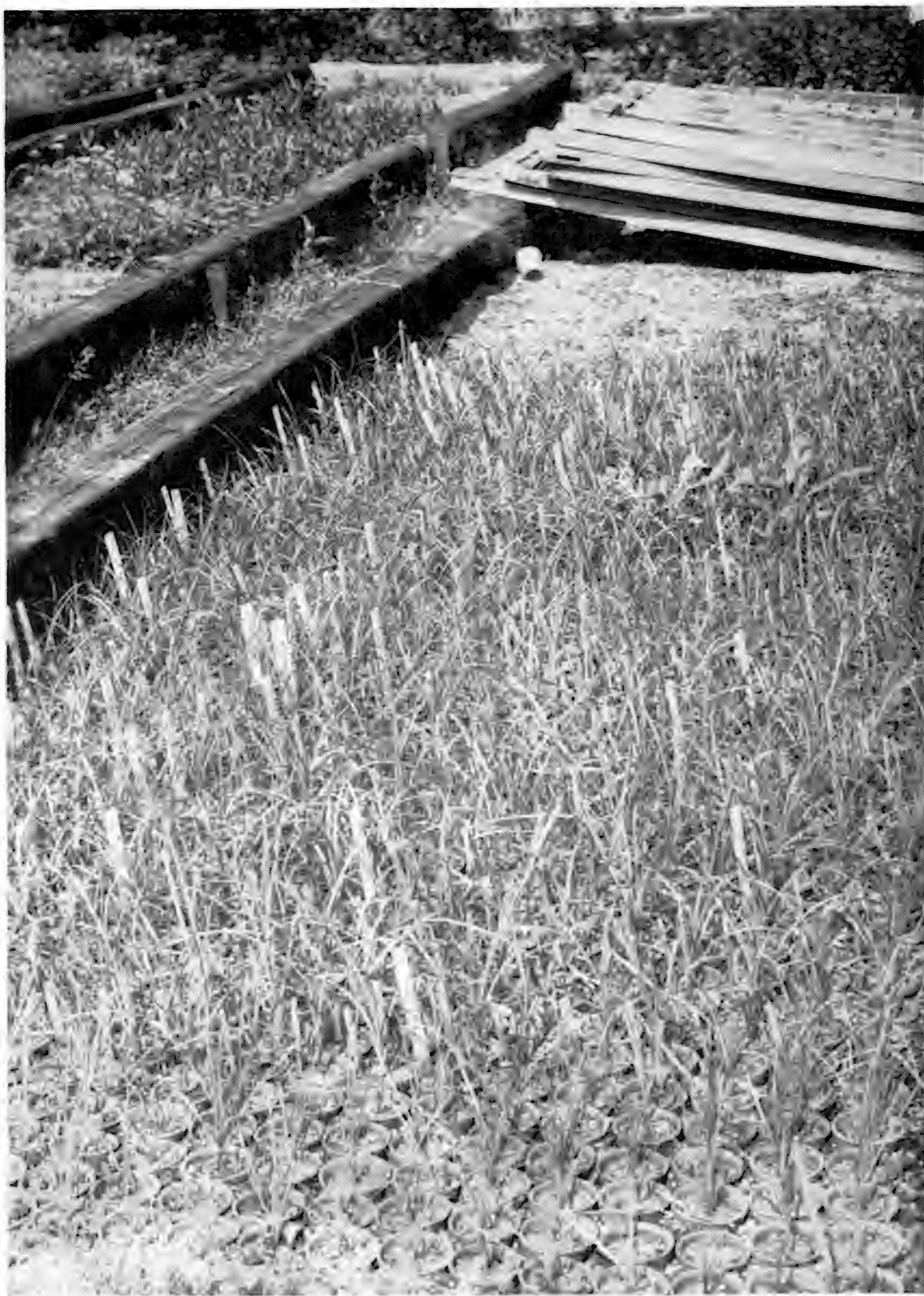
when he, beaming with joy showed me his latest daylily introduction—*Magnifico*, growing in a large pot in his small propagating house. Prior to this date he had given me *Beauty*, *Chrysolite*, *Corona*, *Halo* and many others. It is to be regretted that he lost *Frances*, which he described as being one of his best seedlings raised by using *H. aurantiaca major* as seed parent.

About 1895 Karl Ludwig Sprenger, the famous Italian plant breeder, after a visit to my nurseries, sent along a plant of *H. citrina*. The possibilities of these plants were now becoming apparent; I became interested in the genus and the following year intercrossed this species with *H. flava*. A visit to Messrs. Kesselring's nurseries in St. Petersburg secured *H. Middendorffii* and other species and varieties, which with the several varieties previously secured from Mr. Yeld, *Ajax*, *Golden Ball*, *Noceriensis* and *Dr. Regel*

from Mueller, formed a nucleus upon which to work. The results were not encouraging, almost the only variety worthy of selection being a shy-flowering hybrid between *H. citrina* and *H. flava*. The first plant of this was sent to Mr. W. E. Gumbleton of Queenstown, Ireland, a keen amateur who was particularly interested in *Hemerocallis* and did much to foster my own enthusiasm. A deal of correspondence passed between us and on Feb. 3rd 1905 he wrote:—"Do you still esteem as good and distinct varieties, three *Hemerocallis* hybrids you sent me some years ago—named *Sovereign*, *Gold Dust* and *Orangeman*? If so, I could let you have them back, I can see little difference between them! Your



Amos Perry



Perry daylily nursery; seeds sown in mid-January; photo July 20, 1941

hybrid of *H. citrina*, though it bloomed nicely for me in 1903 did not flower at all last year; the species *H. citrina* growing alongside is in bud.”

After this I made little or no headway and lost all interest in the genus for many years; other families were more prodigal with results so that between 1906-1930 my interests were centered around asters (Michaelmas Daisies), geums, lilies, papavers, spiraeas and monardas. During the 1914-18 holocaust, business was at a standstill and during this interim I started cross-breeding *Iris* species and the *barbata* (June-flowering) varieties. The venture was not unsuccessful. As a direct result of these labours I received 43 Awards of Merit, gold and silver medals, the Dykes Memorial Medal, the Foster Memorial Plaque; and produced such interesting hybrids as *Margot Holmes* (*chrysographes* x *Douglasiana*); *Wat-bract* (*Watsoniana* X *bracteata*); *Tebract* (*tenax* x *bracteata*); *Tebract Brilliant*; *Delavayi pallida*; *chrysowegi* (*chrysographes* x *Hartwegi*); *Harten* (*Hartwegi* x *tenax*); *Doug-graphes* (*Douglasiana* x *chrysographes*). Just after the war Mr. J. C. Wister, President of the American Iris Society, visited my nurseries and in a note on what he had seen of interest in this country, wrote “Getting into London I had a hard schedule ahead to see the *Iris* gardens. I went first to see Perry’s as he was nearest London. I found his *Iris* in full bloom. If I had been pleased with the seedlings at Cayeux’s and Goos and Koenemann’s I was literally knocked off my feet with what Perry had to show. I began to rate them so high that I began to wonder if there was anything wrong with my eyes.”

However, *Hemerocallis* were not entirely forgotten and during those enforced years of reduced activity (1914-18) I gradually acquired further new varieties. These were used as seed and pollen parents in conjunction with our own stocks so that the 1920’s began to show some results.

In 1921 I introduced *Lady Fermor Hesketh* (*thunbergi* x *citrina*), named after an American lady of great charm—the mother of our local Member of Parliament; quite distinct from any other form in my possession. During the summer of 1920 Mr. George Yeld visited my nursery and was much impressed by my many selected seedlings and told me he considered it a great honour to have such a beautiful variety as *George Yeld* (*thunbergi* x *cypriana*) named after himself and remarked “it will be a good plant when my name is but a memory”; this was subsequently offered in 1925 and plants were freely distributed to U. S. A., Holland, India, Canada etc.

Another variety that received much attention was *Margaret Perry* (*Fulva* x *cypriana*). *Chrysolora*, *Gold Standard* and *Erika* were the best of my 1921-25 introductions, and last but not least *Viscountess Byng of Vimy* which was highly esteemed and found favour with the many American and European visitors to my garden during 1925 and onwards, and has been freely used in America for breeding purposes. This plant has given me a lot of trouble both at home and overseas by correspondence, my attention being called among other things to the



Perry daylily nursery: selected seedlings for future trials and cross-breeding

several published criticisms of my attempt accurately to describe this bewitching little beauty; but still I do not care, I know it is a good plant and when introduced was distinct from any other form on this side.

1926 ushered in *Eldorado* and by 1927 I was offering 39 species and varieties, including *Gold Imperial*, *Iris Perry* and *Mrs. Perry*. In 1927 Mr. Franklin B. Mead visited my nursery and was much impressed with the seedlings—especially those of *Margaret Perry* crosses. In October, 1928 he wrote from Fort Wayne, Indiana, “I am sending with my compliments a plant of *Hemerocallis Hyperion* in return for the many courtesies which you extended and in memory of the pleasure I had in seeing you and your nurseries a little over a year ago.” *Hyperion* proved a first-rate seed and pollen parent and some good results were obtained, as I shall mention later.

During 1933 *Byng of Vimy* was introduced and named by special permission of that great General who won international fame during 1914-1918. 1934 produced *June Boissier* and *Sunset*; 1935 gave us *Elizabeth Pyke* (*Middendorffii* x *fulva*)—the first good dwarf (18 ins.); and 1936 ushered in *Mars*, rich tangerine-orange, crimped petals; *Bellona* (*Imperator* x *fulva rosea*), delicate shade of orange-apricot; *Sri Chandra* (*Reggie Perry* x *fulva rosea*), delicate shade of reddish-apricot, green base; *Idele* (*Reggie Perry* x *fulva rosea*), deep reddish-apricot; and *Lamia* (*Cinnabar* x *fulva rosea*), medium-sized flowers, orange-red. Many of these, and others, were crossed with *Hyperion*, and the most outstanding of the progeny were given the following provisional names (I have found this system less confusing than the use of numbers in the field); definite names will be given later.

Ceres (*Hyperion* x *Reggie Perry*); an exceptionally large, short-cupped flower, rich butter-yellow, the whole flower of great substance, petals as stout as a *Camelia*.

Clacton (*Mars* x *Hyperion*); deep orange, 6 ins. across.

Dublin (*Idele* x *Hyperion*) rich orange; 35% of flowers semi-double; flowers open early morning and remain in good condition till 11-12 next morning.

Forty Hill (*Idele* x *Hyperion*) rosy apricot-bronze, madder zone.

Frinton (*Hyperion* x *Sri Chandra*) broad overlapping divisions, bronze-apricot.

Golden Hind (*Hyperion* x *Wau-Bun*) extra large, rich yellow. June.

Perth (*Hyperion* x *fulva rosea*) reddish crushed-strawberry, distinct shade.

Paignton (*Hyperion* x *Bellona*) crimped divisions, soft bronze.

Rugby (*Hyperion* x *fulva rosea*) large open flowers, rich crimson-claret.

During 1935, I raised a number of *H. Forrestii* hybrids, one of the best, *Fumy* (*Forrestii* x *Middendorffii*), forms compact tufts of medium thin foliage; flowers rich tangerine-orange, reddish-brown shaded reverse; flowers are produced in great profusion from 6-10th June onwards; 3 ins. across, slightly crimped.



Perry Nursery; one of two bomb craters 62 feet apart; note wreckage of orchid greenhouse that stood in this spot; water lilies in crater pond, and daylilies on margin.

Hemerocallis fulva rosea, a present from Dr. Stout, has worked wonders and transformed this genus—the second, third and fourth generations are wonderful—and I am of opinion will be responsible for lifting this interesting genus from obscurity to one of the most popular of our summer-flowering border perennials.

Bijou and *H. multiflorus* have given me a new race of great beauty and interest, one of my finest is *Phillipine Green* (*Lamia* x *Bijou*) a delightful little beauty; neat tufts of grass-like foliage from which emanate slender branching stems bearing numerous small, well shaped flowers, barely 2 ins. across; pretty shade of orange-red; not more than 15 ins. over all.

These forms were greatly admired at a recent exhibition in London when 123 named and unnamed hybrids (selected from about 7000 seedlings produced over a period of three years), were shown—many of them for the first time (See Plate 205). All these forms are distinct and many others are coming into flower for the first time: selection becomes increasingly difficult, I can't throw away any that show promise—they are too precious—but am afraid of being accused of naming too many. (See Plates 200 and 201.)

Although *Hemerocallis* and the other herbaceous plants mentioned have occupied so much time and affection, the dominant interest of my life has been hardy ferns and water plants. The latter subject has a fascination all its own and it has been a great source of satisfaction to witness the evolution of this form of gardening from the humble tub-garden of the last century to the attractive pools and warm water tanks of this “concrete age.” High explosive bombs dropped recently on my nursery at Enfield may have destroyed our collection of *Scolopendriums* (which took my father and me about 70 years to gather together), but the craters have formed fine new ponds and as such are now supporting water-lilies—surely the fairest flora that ever came out of a bomb-hole! (See Plate 202.)

I am a Member of the following standing Committees of the R. H. S.:—Floral Committee B.; Cory Cup Committee; Iris Committee; *Lilium* Committee; Alpine Committee.

I am also Founder Patron, Guild of Trade Horticulturists.

BERTRAND H. FARR

The following excerpts from a biographical sketch of the late Bertrand H. Farr, by Dr. A. B. Stout, are reprinted with permission from the Journal of the New York Botanical Garden for December, 1924, the year in which Mr. Farr passed away:

“Bertrand H. Farr died at his home in Wyomissing, Pa., on October 11th., only a few days after a sudden apoplectic stroke and only three days preceding his sixty-first birthday. Death has thus removed a leader in the field of American floriculture; one whose work and accomplishments have been conspicuously noteworthy.

Mr. Farr was born in Vermont. At an early age he moved with his parents to Wisconsin and then into Iowa. He attended public schools in Iowa and at the age of twenty went to Boston, Mass., where he studied music for several years. Thereafter for a period of about twenty years he was engaged in business, chiefly that of selling musical instruments. It was this work that at last took him to Reading, Pa., and led to his having a home at Wyomissing.* * * While a student of music in Boston, he spent many hours among the plants of the Hovey gardens. Throughout the years of conducting a music store, flower-growing was his hobby, until in 1910 his hobby became his business and he was happy. This was but a natural development. First his home-garden collection of flowering plants spread over vacant lots until several acres were under cultivation. Then a farm was purchased and the Wyomissing Nurseries Company was established. At the time of Mr. Farr's death the nursery was being removed to a still larger farm nearby. The business had been incorporated and will now be continued by those who were associated with him.* * * Mr. Farr was widely known as an authority on the peony and the iris.* * *

Mr. Farr has been a frequent visitor at the New York Botanical Garden. He was much interested in all our collections of hardy flowering plants and he gave freely of such plants as the bearded and the Japanese irises to increase the collection and make them more complete. He supplied a complete set of the various day lilies (*Hemerocallis*) in cultivation for use in the breeding work now under way in our experimental plots. Last summer he inspected the numerous seedlings that were in bloom and arranged to name and distribute some of the best of these."

Mr. Farr gave us the very fine daylily clone,—*Ophir*, that thrives equally well North and South. It is gratifying to all that the ones associated with him during his lifetime in the Wyomissing Nursery Company are carrying on where Mr. Farr left off, and they are to be congratulated on the success they have achieved. True to Mr. Farr's original purpose they continue the daylily as one of their specialties.

Beltsville, Maryland,
November 29, 1941

—H. P. T.

HANS PETER SASS

AN AUTOBIOGRAPHY

I was born in Alt Duvendstedt near Rendsburg, Schleswig-Holstein, Germany, September 19, 1868. In 1884 my parents emigrated to the United States of America with family and settled in Omaha, Nebraska. The next spring we moved to a farm ten miles west of the City and pursued general farming. I was the second son in the family and as the younger boys grew up I worked for a year on a dairy ranch in the State of Washington. In 1893 I came back to Nebraska and rented a farm for

myself on a ten years' lease. In 1901 I was married to Miss Elsa Ohm, and the next year I bought an 80 acre farm near Elkhorn, Nebraska, and now Midwest Gardens. As I was very much interested in plants, particularly in floriculture, I at once made up my mind to beautify the new home with flowers, shrubs and trees. I had studied botany at Rendsburg in my youth. As I lived in the country, several miles from town, I had to bring the plant material along to be studied in school. This naturally heightened my interest in plants.

At the new place in Nebraska, I found a neglected garden in front of the house, and here I dug out a large patch of the *Fulva Kwanso* daylily for I wanted to devote this space to other flowers. I also found *Fulva Europa* growing on the premises but dug out most of it. I had



Fig. 61. Hans Peter Sass.

a dislike for rapidly spreading rhizomatous plants. At that time I had to practice rigid economy, but fortunately I had Park's Floral Magazine, published by the Geo. W. Park Seed Co., La Park, Pennsylvania. This Company sold seeds and plants very cheaply, and I started out with a great variety of plants, many of them not adapted to the Great Plains Region where I make my home.

Among the plants I received there was the Great Orange Daylily, *Hemerocallis aurantiaca major*, and when it bloomed I made crosses between this and *Fulva Europa*. The experiment was a failure for no seeds set. For the time, I gave my attention to other flower subjects, mainly irises and peonies. In fact, my breeding of daylilies has been sporadic. Often

heat and drouth interfered with seed setting, or the young seedlings perished in a year of extreme drouth and heat.

In 1916, I bought a collection of daylilies from the late Bertrand H. Farr, including some of his *H. citrina* hybrids. These produced tall scapes and I then made crosses between these, and *H. aurantiaca major*. This was a success but the flowers of the first generation were not up to size. I crossed the better individuals back on *Major*. In 1932, I made a selection of the best. Some of these were named later. I now have the third generation in bloom, all with yellow coloring, from Martinus Yellow to near orange. These are mostly from 1938 seeds for the drouth years from 1930 to 1937 were not favorable for daylily breeding. So far I have not used *H. fulva rosea* or the pink and red clones. As a daylily breeder I am not up to date.

I have introduced the following daylily clones: *Sunny West* (1933); *Golden West* (1933); *Star of Gold* (1934); *Hesperus* (1937); *Nebraska* (1937); *Moonbeam* (1940); *White Lady* (1940), and *Revolute* (1941).

My breeding with irises has been successful as shown by the many awards and medals received, including the Dykes Medal. My peonies are also coming to the front as the last ratings indicate. I have also experimented with Oriental poppies, *Umbellatum* lilies and many other flower subjects.

PAUL HOWARD COOK

AN AUTOBIOGRAPHICAL SKETCH

I was born near Poneto, Wells County, Indiana, in 1891. I became interested in plant breeding about 1910 after reading some of L. H. Bailey's books, and took up the work seriously as an avocation in 1916. I was attracted first to the small fruits, but gradually settled on *Iris* as a principal genus to hybridize, an interest that is still dominant.

The determination to take up *Hemerocallis* as a group to hybridize followed a meeting with the late B. H. Farr in 1923, and a collection of species and hybrids was secured that year. In this original collection were the species *H. flava*, *H. Middendorffii*, *H. Dumortierii*, *H. serotina* (*Thunbergii*), *H. citrina* and *H. fulva Europa*, and the named hybrids—*Apricot*, *Aureole*, *Gold Dust*, *Sovereign*, *Luteola*, *Ochroleuca*, *Baroni* and *Calypso*. The next year the species *H. aurantiaca* was added.

I began making daylily crosses in 1924. One of the plans at the beginning was to cross each two species separately, and from the first hybrids to raise large second generation progenies, in order to learn something of the inheritance of daylily characters. This proved too large an undertaking, even in a genus of comparatively few species, and it was carried through only in the case of *H. serotina* (*Thunbergii*) x *H. citrina*. The best early seedlings came from the use of *Calypso*, *Luteola* and *H. aurantiaca*, the flowers of many of these showing large size, substance and good form. *H. serotina* (*Thunbergii*) x *H. fulva Europa* gave four very different seedlings, one of which was fully fertile and later proved useful in work for red flowers. A cross between two first hybrids, [*H. serotina* (*Thunbergii*) x *H. citrina*] x (*H. flava* x *H. Middendorffii*) was one of the most interesting of those made early. Flowers of some of these seedlings had very wide segments. A very pale yellow came from *Calypso* x *Calypso*, and this seedling was much used in crosses. However, though some very pale yellows appeared, nothing in the way of an approach to a white flower ever showed up in any of the lines based on this pale seedling, even where the breeding was very close. Early trials to extend the color range in *Hemerocallis* by attempting outcrossing to *Hosta*, *Paradisea* and *Leucocrinum* ended uniformly in failure.

Beginning in 1931¹ the best of the yellow and orange seedlings already obtained were used in crosses with the new *Hyperion*. For the

¹ The clones **Vesta**, **Margaret Perry**, **Mikado**, and some Betscher clones were also added to the collection in 1931.

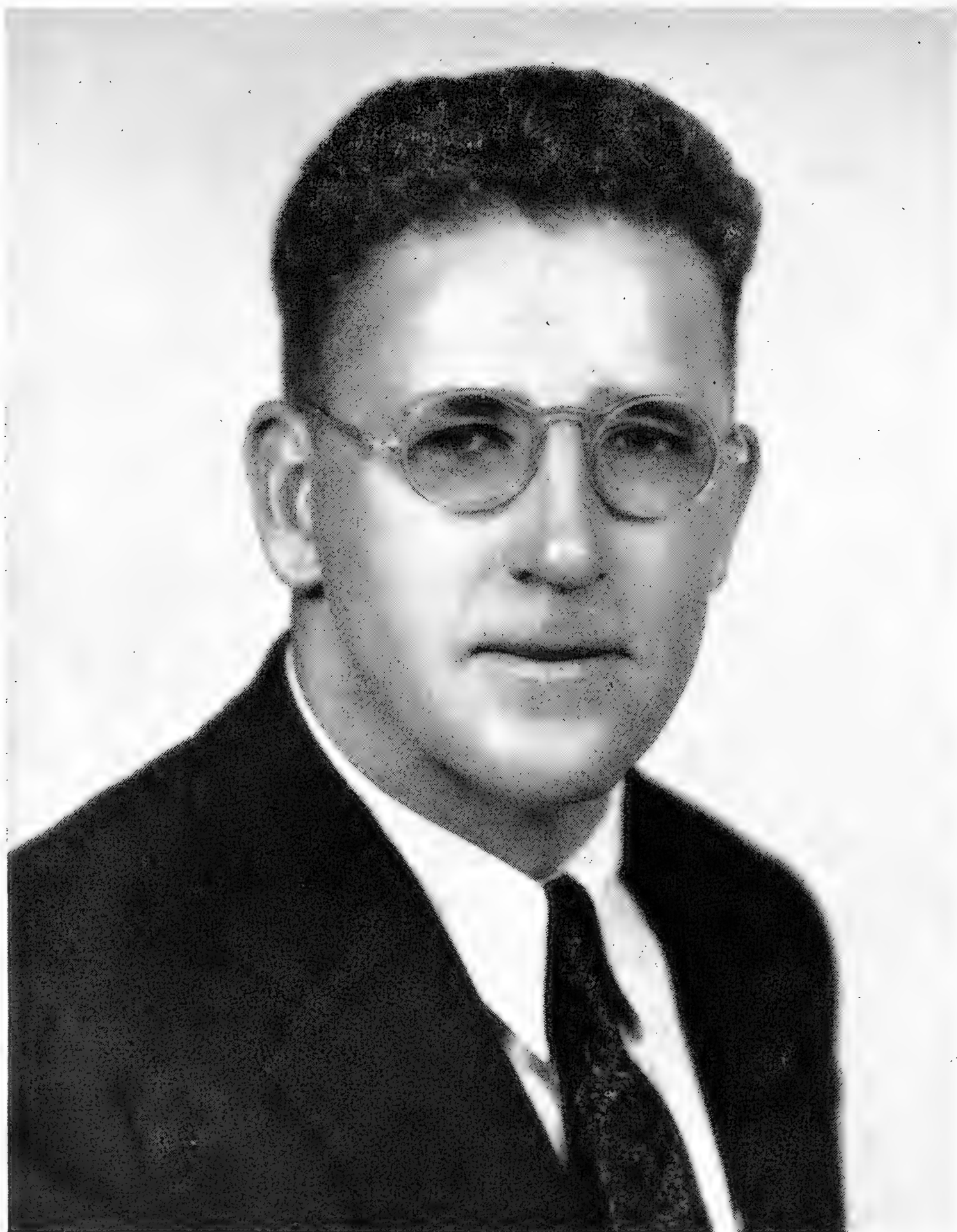
most part, these seedlings from *Hyperion* have provided the foundation for the strains of yellows and oranges now under development. The present red line is based chiefly on deep fulvous seedlings from *H. aurantiaca* and the seedling from *H. serotina* (*Thunbergii*) x *H. fulva Europa*. These reds are being intercrossed, and they are also being crossed to *Rosalind*. The daylily breeding is now confined to the set which flowers in July in northern Indiana, and the main interest is in



Fig. 62. Paul Howard Cook.

the clear yellows and oranges, especially flowers having wide segments and good resistance to sun and drought.

From the beginning to the present time some 12,000 seedlings have been raised; many of the more recent of these are third and fourth generation descendants of earlier seedlings. The largest set, 3,500 seedlings, flowered in 1940. Three seedlings have been named. These are *Stalwart* and *Gloaming*, both from *Calypso* x *H. aurantiaca*, and *Sharon*, from a Farr variety x *Calypso*.



Herbert Medalist—Wilfred MacDonald James

THE 1941 HERBERT MEDALIST

The award of the William Herbert Medal to Wilfred McDonald James in 1941 marks a mile stone in the advancement of the amaryllids. Prior to this date it was a matter of awarding honors long past due. With the 1941 award, the Society bestows the Medal on an American worker who has made his contributions in this field mostly during the past decade, and in close cooperation with the Society since its organization.

Mr. James is an honest, modest man who by sheer genius and hard work has made important contributions toward the advancement of the amaryllids as shown by his contributions to past issues and the present issue of *HERBERTIA*. He has been active in introducing new amaryllids from abroad, and has diligently sought to determine their value to the American gardener. He has made important contributions to amaryllid cytology, culture, propagation, and storage. He has been an active plant breeder particularly with nerines and gladioli. An outstanding achievement is his charming hybrid *Nerine* (*N. filifolia* x *N. corusca major*), *Chameleon*. His contributions as a plant breeder have just begun, and we can expect much from him in the future.

The straight forward life story briefly sketched by Mr. James, which follows, is typically American. It proves once again that those who deserve of success in this Country of ours are bound to achieve it. In these trying times, it is another concrete reminder to us that our way of life is worth defending against Nazi threats.

We are proud to claim Wilfred McDonald James as a fellow American, and we hand him the William Herbert Medal with congratulations from all the members of the Society.

—*Hamilton P. Traub*

WILFRED McDONALD JAMES

AN AUTOBIOGRAPHICAL SKETCH

I was born August 8, 1893 at Springdale, Cedar County, in the east central portion of the State of Iowa. When I was ten years old, my parents moved to Pasadena, California, in October 1903. In 1914, I graduated from the Pasadena High School, and in 1916 I completed the non-degree course of the Northern Branch of the College of Agriculture of the University of California.

When America entered World War I, I enlisted in the Field Artillery Branch of the U. S. Army, in June 1917, "for the duration." I was overseas in the A. E. F. for eighteen months, and took part in one major engagement and several smaller ones. After the Armistice on November 11, 1918, as a member of the A. E. F., I attended the Royal Technical College in Glasgow, Scotland, during the spring semester in 1919. After returning to America, I was honorably discharged from the U. S. Army, August 8, 1919.

From 1919 to the fall of 1925, I worked mostly in Los Angeles, California, at various nursery and gardening positions in order to gain experience with plants. I also performed carpenter work for part of the time.

In November 1925, I took up a position with the Hope Ranch Park Homes Association at Santa Barbara, California. My duties consisted of supervising roadside planting in Hope Ranch Park, and assisting property owners in developing new home sites.

Early in 1929, Mr. and Mrs. William R. Dickinson started building a home in Hope Ranch Park. In June 1929, I took charge of their Estate as head gardener. On this Estate I was able to really make use of my experience by developing several small, connected gardens, and the Las Positas Nursery. I wish to take this opportunity to publicly thank them for their generosity and confidence in allowing me almost complete freedom in the selection and management of material, especially in the Nursery. It was an opportunity seldom encountered, and was much appreciated.

In the Nursery, plants were obtained wherever possible from all parts of the world and tested for garden and commercial value. Besides the study of the amaryllids mentioned in several issues of HERBERTIA [*Pharium* (syn. *Bessera*), *Milla*, *Leucocoryne*, *Brodiaea*, *Lycoris*, *Nerine*, *Cyrtanthus*, *Amaryllis*, *Callicore*, *Alstroemeria*, *Bomarea*, *Hymenocallis*, *Ismene*, *Phaedranassa*, *Cybistetes* (*Ammocharis* ex parte), *Nothoscordum*, *Haemanthus*], I took an especial interest in hybridizing various *Gladiolus* species. Some splendid winter-blooming forms have been developed, one of which, *Winter Fairy*, is already on the market. One of these blooms in sixty days after planting. These forms are quite different from the summer-blooming types.

As can be imagined, many problems were encountered in connection with the many new plants brought together at Las Positas Nursery. Some of these may have been at least partially solved, although I feel that as a whole the majority remain unsolved. While living in Hope Ranch Park, I was fortunate in meeting people from all walks of life, and from many parts of the world. Often I have been asked where I received my training, and most of those asking the question did not seem to understand that specialized experience can be obtained by extra effort and study. However, "midnight oil and elbow grease" will avail little without the help of others, and I am deeply indebted to many for their counsel and advice.

In September of this year, I took charge of Rancho Rinconada, which is owned by L. M. Boyle, and is located at Ojai, California. Although my new work will be principally with cymbidiums and camellias, I do not intend to lose my interest in the amaryllids. The Society's test material is being moved from Las Positas Nursery to Rancho Rinconada. I also expect to carry on many of the hybridizing and other experiments started at Las Positas although I will not have the quantity of some of the kinds of material to work with at the start.

I married Ruth Putnam in June 1921, and we have three children—Robert, 16½ years; Richard, 12 years; and Barbara, 9½ years old. Mrs. James has had a full share in all of my accomplishments since our

marriage. During our association, many of my projects were completed only because of her encouragement and support.

My mother passed away in 1911, and my sister followed her in 1916. My father is still living and takes a keen interest in my work, although he is 80 years old. I have a younger brother who is Vice President of Operations of Western Air Lines.

Needless to say, it is impossible for me to fully express the pleasure and appreciation that I felt when I received notice that the William Herbert Medal for 1941 had been awarded to me by the Society. It is my sincere hope that I may continue to warrant the honor that it brings.

HUBERT FISHER, SR.—IN MEMORIAM

“Hubert Fisher, Sr., florist and nurseryman at Germantown, Tenn., died unexpectedly June 17 at New York at the age of 63. Apparently in good health, except for the deafness with which he had been afflicted for thirty years, Mr. Fisher had left Memphis to attend a reunion of the Princeton University class of 1901 at Princeton, N. J.

Born at Milton, Fla., he matriculated first at the University of Mississippi, where he received his B.A. degree, later taking his M.A. degree at Princeton. He was admitted to the bar and entered the law firm of Carrol & McKellar at Memphis. In 1917 he was elected to Congress, serving until 1931, when he established his nursery. His son, Adrian S. Fisher, is assistant to the Assistant Secretary of State at Washington, D. C. His widow also survives, as does another son, Hubert, Jr.”¹

Mr. Fisher was actively interested in daylily breeding at the time of his death. He was using such clones as *Fulva Rosea Rosalind*, *Patricia*, *Byng of Vimy*, etc. He was also growing some of the breeding progeny of Mr. Paul H. Cook, Bluffton, Ind., in order that Mr. Cook could obtain pollen by air mail of his late flowering clones to use on his early blooming ones. Mr. Fisher introduced the red daylily clones *Geronimo*, *Pascagoula*, and *Chisca*.

According to the October 9th. issue of Florists' Review, Mr. Fisher's business was purchased by Oliver Anderson, formerly associated with the Fruitland Nurseries at Augusta, Georgia. It is gratifying to know that Mr. Fisher's work will be perpetuated.

IN MEMORIAM—SIR ARTHUR WILLIAM HILL

It is with the deepest regret that we record the death of Sir Arthur William Hill, since 1922 director of the Royal Botanical Garden at Kew, England. He was killed on November 3, 1941, when thrown from his horse while riding. He was sixty-six years old. Along with his world wide interests in science, he was a good friend of the American Amaryllis Society. His loss will be keenly felt by all who knew him.

—H. P. T.

¹ From The Florists' Review, June 26, 1941.

SOME DAYLILY PROBLEMS

J. MARION SHULL, *Maryland*

Societies for the promotion of special plant interests, whether devoted to the rose, iris, gladiolus, peony, or whatever else may catch the fancy of garden minded folk, are beset by much the same sort of difficulties, have to meet, and solve if they can, much the same sort of problems both in their initiation and in their future development. First a few interested and like-minded workers join forces with Nature in the process of collecting, and then in creating new varieties by the never ending process of mating unlike parents. Their successes interest and inspire others and lure new recruits who go and do likewise and lo a new "Society" is born to devote its energy and enthusiasm to the spread of a special interest.

The group now associated for the promotion—exploitation if you must—of the amaryllids, including the daylily is still an infant in swaddling clothes as compared with veterans of the rose, the peony, etc. Some of these older Societies just grew, much as Topsy did, grew to huge proportions and into problems sometimes insoluble. Could some of these difficulties along the way have been controlled or avoided by earlier guidance, or is every society foredoomed to pass through this same evolution into the same confusion and ultimate chaos?

Can we who are interested in *Hemerocallis* develop that interest in an orderly way through a better understanding of the pitfalls that beset the way of any horticultural society devoted to a single subject? Must the prancing nags that enter the race get out of control and inevitably end in a wild runaway? Let it be understood from the start that the present writer has no illusions as to one man's ability to chart a course for the guidance of all who come after. All he can hope to do is to state some of the major problems confronting such a group. Such understanding necessarily precedes any rational attempt at control.

There are already several hundred varietal names of daylilies recorded and the Society hopes to establish a system of registering and describing of all new additions to the list to avoid duplication of names and to provide better means of close comparison which should help to ward off the naming of too many that are essentially alike. To this end all producers, amateur or professional, are exhorted to great conservatism in the registering or issuing of new names or varieties. This is not meant to operate as a damper on the great pleasure to be had in the co-operation with Nature in the creation of new varieties. It is great sport and should not be discouraged or curtailed. But what are we to do with our surplus good seedlings if we are not to name and distribute them?

This problem faces every grower of seedling perennials and the more his enthusiasm mounts, the larger the number of individuals he works with, the more acute the problem becomes. There is but one thing to do with all seedlings that fall below average quality, unless they possess some unique feature still of use to the breeder. They should be destroyed as soon as they have demonstrated their lack of quality. But out of any batch of seedlings there will be many fine things, and if there were no

competition, all these might be worthy of names and distribution—but only a few will be of outstanding merit in view of the intense competition already provided. The rest are good, but no better than named varieties already freely propagated and moderately priced, and therefore available to all. To name and offer these for distribution is only to build up confusion.

It is fine plant material and, theoretically at least, ought not be destroyed. This being the case, why not offer this superior part of the producer's discards to the public by way of park or other public planting? But make sure that only quality material is so offered. Daylilies are practically free from pests and usually able to maintain themselves indefinitely without costly garden care. Such disposal would provide a sort of antitoxin against too rapid multiplication of registered names and the customary clutterment of a host of varieties that can not be distinguished one from another in the field. It would not deprive the public of such enjoyment as they could give, nor would it tend to curtail purchase of named sorts by the private gardener.

In the attempt at control and guidance there will necessarily develop some system of ratings to express the aggregate judgment either of a specially selected group or Committee of the Society, or a symposium representing the judgment of the Society as a whole. Herein lie many and subtle difficulties. Ratings will necessarily play an important part in the granting of awards—awards being in turn calculated to stimulate competition toward higher levels of accomplishment, though sometimes degenerating to the mere satisfying of personal vanity or craving.

A useful system of rating must demand some degree of uniformity of consideration and the setting up of guides or standard rules for rating, rules that will secure fairness as between varieties and yet not bind at any point to a fixed and inflexible requirement. Lucky indeed would be that Society whose wisdom was sufficient to establish such fortunate rules from the start that no material change would be required in many years! Having to change the basis of rating almost every year because of lack of foresight leaves many an older rating no longer comparable with those of the current year. Most of the older Societies are suffering today from the lack of truly comparable ratings.

Most of them have also been forced to be equally changeful in the matter of awards and in many cases have failed to find an equitable and workable system of awards. Usually a Society adopts some graduate system of award values, as Honorable Mention, Award of Merit, and sometimes a special award outranking these. Sometimes awards take the form of "Certificates" of varying degrees, or again there are medals of varying ranks. To make these awards on a rational basis again requires rules and regulations that may be wise or unwise according to the ability and foresight of the agency that sets them up. In regard to eligibility for the major awards it seems doubtful if any arbitrary age limit should be set up in the regulations. A worthy variety should be eligible to receive honors on merit alone and regardless of whether it was produced yesterday or twenty years ago. Under the regulations of some Societies the finest variety of all may never receive an award simply because it did

not have the good fortune to be seen by the right people within a restricted time limit. This should not be allowed to happen with the day-lilies.

Because of the recognized need for reliable comparative valuation of merit most plant societies have at some time or another attempted a solution by way of test gardens. The idea is very appealing and but for several very large and stubborn "ifs", would provide just the data required. Let us examine some of these "ifs". If we were not such a wide-spread and diverse community, with the utter impossibility that a single test garden could serve all with equal fairness, such a garden would be the ideal solution. But soil and climate vary so greatly from state to state and even within the same state that it would require many test gardens scattered all over the country to determine authoritatively the nation-wide deserts of a given variety, or the exact boundary within which such variety would prove exceptionally desirable and in what regions it should be excluded as unsatisfactory.

And even a single test garden becomes a costly thing to maintain, and a complete system of regional test gardens may be set down as a Utopian dream. Land must be occupied, and labor employed, and this on an ever increasing scale to accommodate the continuing expansion of introduction by enthusiastic breeders and distributors. I know of no single-flower association wealthy enough to provide and maintain such an official means of evaluating an unlimited number of new offerings.

If a Board of Judges, or even a single qualified Judge could visit every significant garden wherein new daylilies were being evolved, such desirable comparative data could be gathered and placed on file, but here again the cost would be prohibitive even if the task should not prove physically impossible since the best of judges still find it inconvenient to be in two widely separated places at the same time.

Perhaps the situation is not quite so hopeless as I have pictured it, for while no conceivable complete system of test gardens seems financially feasible it may be possible to arrive at something on a co-operative basis that would cost less and yet be worth doing. Best opportunity for this would probably come from some form of co-operation with established institutions such as Colleges of Agriculture, Botanic Gardens, or Park Authorities. However, if continuing usefulness is to be secured and maintained, some means must be found to prevent pyramiding of expenses. It would be impossible for such gardens to accept all new offerings for test unless some provision for discard is adopted that would permit area of ground occupied and labor involved to be reasonably stabilized. With this in view I offer the following suggestions.

All new and current offerings should be accepted without question and be given good planting and care for a predetermined period of say three or five years, long enough to become well established and yield typical growth and bloom, at the end of which period they should be appraised individually by a competent authority and only those attaining a very high standard of horticultural desirability retained. The rest should be summarily dropped from further test in this regional Test Garden and bodily removed from the premises. By adopting such a

scheme the co-operating Institution's burden for support would be fairly standardized.

The few top ranking varieties retained would be planted apart in a permanent plot, limited if need be to a fixed maximum number, say perhaps a hundred. When this maximum had been attained additions at the top would be compensated for by discards from the bottom. Such a Test Garden when fully mature would offer a collection of the hundred "best" for that region and this would become a valuable display garden and means of reference for all visitors. In addition to this elite group there would be the trial plantings consisting at any one time of the new offerings of breeders during the last three or five years as the case might be. These would vary slightly from year to year but by reason of the annual clearance either to the permanent display garden or by discard, the ground occupied and the labor of maintenance required would remain approximately the same in successive years and could be provided for in budget estimates with reasonable confidence. Such Test Gardens would be very useful and might escape the pitfalls that have usually proved fatal to such attempts in the past.

BOMBING AMARYLLIDS

EXCERPTS FROM MAJOR PAM LETTER ¹

"I am sorry to say that the bulk of my collection of amaryllids has been seriously damaged and although some might recover in time, I have lost heart and am seriously considering giving away most of my species and only retaining a few *Pamianthe* and a few special plants. I had a high explosive bomb dropped within 50 yards of this House and quite close to my Head Gardener's cottage. The blast from this sucked most of the glass out of my greenhouses and the mess was really dreadful when we went there next morning. Only about 10 per cent of the glass was in place, the rest was scattered all over the place; a lot of glass had fallen into the houses and cut the leaves and bulbs very severely, pots of plants had been knocked over, some on the floor, and it was one of the most depressing sights for a keen gardner you can possibly imagine. Very luckily the night, and the next two, were fairly mild; if there had been a hard frost, all the plants would have been killed. One of my sunk pits was not as badly damaged as the rest, and with a lot of help from outside we were able to get some canvas and tarpaulins over the worst parts, and move the more precious plants into that pit; but many of them were in a terrible condition and at this season very little can be done; when a plant has lost three-fourths of its leaves, it is maimed for years, if not for ever.

"By good luck, my fine batch of *Pamianthe* did not suffer as much as other things, and I shall try to keep these going, even if I have to discard all the others, which will probably be necessary. At present all my plants which used to grow in a long range of about 50 yards are concentrated in a small pit about 10 yards long; you will realize that they

¹ Letter from Major A. Pam, Wormley Bury, Broxbourne, Herts, England, dated March 16, 1941.

cannot be grown so close together, but I have not made up my mind which ones will have to go, as I have some very rare plants apart from my collection of amaryllids, many of which have a great sentimental value as having been given me by friends now dead. I expect that I shall be able to reglaze the pits properly, and perhaps also a small lean-to house for decorative plants for the House and for tomatoes, but it is evident that the bulk of the collection will have to be discarded, including a number of good cymbidiums, cypripediums and other orchids.

“I had had 3 high explosive bombs on my land in November, which did a lot of damage to my glass houses, but I had everything made good and the glass replaced, and hoped that this would be the end of Hitler’s attack on a purely country area without any military objectives. But I cannot do this again, and must resign myself to the position as it now is, with thankfulness that the bomb did not drop 50 yards nearer and destroy this House and kill my family and all the many inhabitants.”

AMARYLLID MUSINGS

W. M. JAMES, *California*

Each year, almost each day, brings new problems or reveals phenomena which we would like to understand. To begin with, please turn to page 242 in HERBERTIA, Volume 4, 1937, and note the picture of *Leucocoryne* and the explanation accompanying it. As stated, the shallow growing bulbs were separated from the others and their seeds were also kept separate until after the first blooming time. So far all of the seeds from these “separate bulbs” have required the usual time of three years to grow to flowering size.

The winter of 1940 was exceptionally warm in Southern California. During this growing period, these selected bulbs went down to their usual depth of 12 to 15 inches, in spite of the fact that they had bloomed for two seasons after flowering in the seedling bed. Bear in mind that bulbs from pounds and pounds of *Leucocoryne* seed planted over a period of years have invariably gone down 12-15 inches deep before flowering, and after flowering at this depth in the seed bed, have always stayed at any depth they were replanted. Does this not indicate, for one thing, that this bulb prefers cool “feet”?

Another item is becoming alluring. For several years I have noticed that occasionally a bulb will make a complete circle or ring of offsets around itself, instead of the usual two to four. This is not limited to one genus, as is shown in the picture of *Nerine Bowdeni* and *Haemanthus Katherinae* (See Plate 204). A picture of a bulb of a *Brunsvigia-Callicore* hybrid on page 43 of HERBERTIA, Volume 7, 1940 also shows this unusual development.

These offsets seem to initiate between the 1st and 2nd and/or the 2nd and 3rd scales from the outside of the bulb and take two years to make the growth shown in the pictures. I have had no opportunity to segregate any bulbs and observe them individually over a period of time. This excessive production of offsets does not seem to be limited to any certain

individual bulb or its offspring. Size does not necessarily influence it, as the picture of *Nerine Bowdeni* plainly shows. I hope that I, or someone else, will have an opportunity in the near future to determine whether it is age, or environment, or an individual inherent characteristic which causes this excessive development of offsets.



Fig. 63. *Crinum* species from Southwest Africa.

Amaryllis candida is proving a very poor seed parent. When the seed pod is about one-half grown, it forms what is apparently an abscission layer between the ovary and the end of the pedicel and falls off. This is my first experience with anything of this nature. Next season I



Bulbs of Nerine Bowdeni, upper, and Haemanthus Katherinae, lower, showing development of offsets.

hope to be prepared to use the plant hormone treatment which is being tried on apple trees to prevent premature dropping of fruit. If anybody has any suggestions, I will appreciate them.

For some time we have had an interesting bulb at Las Positas Nursery which came in as *Nerine multiflorum* from a collector in South-west Africa. The dry bulbs had no resemblance to any of the *Nerine* bulbs I had seen. Neither did the first foliage resemble that of nerines. The first flower indicated rather clearly that it was not a *Nerine* and probably was a *Crinum*. (See Figure 63.) Some of these bulbs were sent to Dr. Dyer at Pretoria, South Africa, for identification. These have bloomed and he says that it is a *Crinum*, but has not had time to determine the species. And now we come to the point!

For several years these bulbs have bloomed freely during the summer, but no seed has developed. I have always been a little puzzled because I never seemed to find any pollen on the anthers. One afternoon this summer I was "fooling" with a bud and found that the anthers were open and the pollen falling. It did not take much time to determine that the bud starts opening in late afternoon and is completely open about sundown. If it is a warm, dry evening the pollen all falls off the anthers before morning. If it is a damp, foggy evening, the pollen does not fall until the air is drier and may stay on for some time the next morning. Flowers which were pollenized an hour or two after dark all set seed, which develop nicely. This seed germinated readily and is growing vigorously, including crosses with two other species. Although this may be a characteristic of crinums, I was not familiar with it and neither were any of my friends in Santa Barbara.

Another problem was solved this summer. On *Milla biflora*, it was found that the anthers open, and the pistil grows up through them and is fertilized before the flower opens. Consultation with a botanist revealed that flowers of some plants do this, although it was an entirely new phenomenon to me.

In closing, I wish to mention one thing in addition which I am appreciating more and more as time goes on. That is the number of friendships and acquaintances made both by correspondence and actual contact through a mutual interest in plants. And it does not seem to make much difference whether the other person is on the opposite side of the world or just down the road a little way.

THE DAYLILY EDITION COVER DESIGN

The cover design for the 1941 Daylily Edition of *Herbertia* was drawn by the eminent artist and horticulturist, J. Marion Shull. The design shows one flower of the hybrid daylily clone, La Tulipe, and is based on material grown at his home at Chevy Chase, Maryland, in 1941.

—H. P. T.



See page 47.

Perry Daylily Exhibit at Royal Horticultural Society Show, summer 1941

1. REGIONAL ACTIVITIES AND EXHIBITIONS

SECOND NATIONAL DAYLILY SHOW

WYNDHAM HAYWARD, *Florida*

The American Amaryllis Society staged its second National Daylily Show at the Mead Botanical Gardens, Orlando-Winter Park, Florida, on June 1, 1941, with brilliant showings of new hybrid *Hemerocallis* and a good attendance of flower lovers from the Lower South.

The exhibition was "benched" on tables and shelves in the rustic lodge of the Garden, and was under the management of R. W. Wheeler, Winter Park. Mr. Wheeler was also credited with the outstanding general display of the show, his entries running from tiny dwarfs to large "reds".

The blooms were placed on exhibition as single flowers and entire flowering stems of the plant. They were arranged in attractive vases and jardinières, and in bowls and baskets. Large collections of the individual flowers were displayed in whiskey "shot" glasses, which proved convenient and satisfactory miniature vases for the smaller blooms. Other flowers were shown in glasses, bottles, paper cups and many other types of containers.

There were three main divisions of the show, as follows:

SECTION I Collections of 5 or more.

- Class 1 Pale Yellow
- Class 2 Deep Yellow
- Class 3 Light Orange
- Class 4 Deep Orange
- Class 5 Fulvous (Including light Mahogany shades.)
- Class 6 Dark Mahogany Shades
- Class 7 Red
- Class 8 Pink (Including the shades approaching pink.)
- Class 9 Pastel Colors
- Class 10 Any Other Color
- Class 11 Dwarf (Stems not more than 18" high.)

SECTION II Best Single Flower

- Class 1 Pale Yellow
- Class 2 Deep Yellow
- Class 3 Light Orange
- Class 4 Deep Orange
- Class 5 Fulvous (Including light Mahogany shades.)
- Class 6 Dark Mahogany Shades
- Class 7 Red
- Class 8 Pink (Including the shades approaching pink.)
- Class 9 Pastel Colors
- Class 10 Any Other Color
- Class 11 Dwarf (Stems not more than 18" high.)

SECTION III Best Flower in the Show; No Class Entry Required.

The judges were Mr. and Mrs. E. L. Lord, leading garden and flower show experts of Florida. Mr. Lord entered a handsome display of his own daylily seedlings which were not in competition. Other exhibitors were Wyndham Hayward, Frank Vasku, Miss Helen Fuller, Mrs. Harry Hasson and Mrs. George G. Scott. The Mead Garden, which cooperated in the show with the assistance of Dr. E. O. Grover, president and Jack Connery, director, set up large groups of daylily flowers in tubs and vases from the mass plantings on the adjacent grounds.

R. W. Wheeler received an award of Merit for his major display entry, and the prize for the best flower in the show; also 9 first place ribbons; 11 second place ribbons, and one third place ribbon. Wyndham Hayward received 10 first place ribbons, eight second place ribbons; Frank Vasku received two first place ribbons, two second place ribbons, and four third place ribbons. Miss Helen Fuller received one first place ribbon, Mrs. Harry Hasson received one third place ribbon.

Both Mr. Wheeler and Mr. Hayward displayed large collections of new and un-named seedlings, in shades of pastels, bronze, "pinks" and "reds" into the dark purple-black color tones. These proved the main attraction of the show to those attending, who stared almost in unbelieving awe at the novelties on view. To many hundreds of them this was their first sight of the highly colored types of *Hemerocallis* hybrids.

Of special interest was a group of three flowers, exhibited by Mr. Hayward for Dr. Leon H. Leonian, daylily breeder and delphinium specialist of Morgantown, W. Va., which were from plants grown for trial purposes in Florida. These were early seedlings from Dr. Leonian's collection, and each received a First Class Certificate. They were given provisional exhibition names of "*Cherry*", "*Dr. Leon*" and "*Cerberus*". "*Cherry*" was the clearest "red" in the show, and "*Dr. Leon*", the best "pink", although still far from a perfectly clear shade of this color. "*Cerberus*" was a huge flower with pointed spreading petals, mahogany black in color with lighter throat and edges. These clones are still under observation and not available for distribution.

First Class Certificates were awarded to *Turbani* and *Halo*, in Mr. Wheeler's collection, while the judges awarded first class certificates to *E. W. Yandre* and *Minnie* in W. Hayward's exhibit. Mr. Wheeler's "best flower" of the show was his notable *Ruby Supreme*, which won a first class certificate at the 1940 Daylily Show.

Rules of the show were as follows:

1. There is no entrance fee.
2. Competition is open to both amateurs and professionals.
3. Tag awards for each class will be made as follows:
Blue for first, Red for second, Yellow for third.
4. Only one entry from each exhibitor allowed in each class.
5. The Potted Plant, cut Flower Stem, or the Individual Flower may be entered in competition, and without penalty in either case.
6. Exhibitors must label each entry with correct name, or, if an un-named seedling, so state.

7. Exhibitors must have all entries in by 11 o'clock A. M., Sunday, June 1, 1941.
8. All entries are to be made in the name of the grower.
9. The Committee will not be responsible for loss or damage.
10. The decision of the Judges is final.

THE DAYLILY COMES OF AGE IN BRITAIN,
PERRY EXHIBIT AT R. H. S. SHOW, 1941

Mr. Amos Perry of Enfield, England, is one of the pioneer daylily breeders. Over a long period of years he has introduced many fine clones, and many of these are thriving in American gardens. The members of the Society will be keenly interested in the success of Mr. Perry's daylily exhibit at one of the 1941 R. H. S. shows (See Plate 205) as indicated by the enthusiastic reports in the British horticultural press. Some excerpts from these reports are given below.—*Ed.*

Garden Work, August 2, 1941: "Tremendous enthusiasm was aroused amongst the visitors to the recent R. H. S. Show, by the marvelous array of *Hemerocallis* staged by Mr. Amos Perry. Never before¹ has so large a display of this flower been made at one time. It was variously reported to consist of anything from fifty to one hundred varieties, but probably the correct figure was somewhere between the two. This exhibit created a most glorious splash of colour, and most of the visitors were undoubtedly impressed by the wide variations in colourings to be obtained in these flowers—rich butter yellow, deepest sulphur, and through every imaginable shade of orange to coppery bronze, and there are even a pale pink, a deep chocolate brown and deep crimson varieties. This display will undoubtedly do much to popularise the daylily as a garden flower."

Nurseryman & Seedsman (Editorial), July 24th, 1941: "At the last show at the R. H. S. there was an outstanding exhibit of *Hemerocallis* staged by Perry, it contained about 100 varieties and ranged in colour from the pale yellow tones to dark bronzy reds. It must have been a surprise to many growers to find such a marvelous range of coloring due, I am told, to the influence of *H. fulva*. It is, however, more remarkable when one knows that Amos Perry started with two plants more than 40 years ago and is now able to give the trade such a feast of varieties."

"Mr. Perry deserves the highest praise for his work and the trade itself should not be unmindful of this fact for sure enough it will help to bring the day-lilies out of their obscurity and reveal them as worthy subjects for all gardens."

Nurseryman & Seedsman (Report of show): "Perry's of Enfield had one of the most arresting exhibits of the show, a long table completely filled with *Hemerocallis* and embracing numerous distinct varieties, the seedlings being representative of many years of work by this Veteran grower."

¹ This statement has reference to Britain. —*Ed.*

“It is said that this is the first occasion² on which this hardy plant, its blossoms featuring every imaginable shade of brown and yellow had been exhibited as a self contained group and it attracted very wide interest. Silver Gilt Lindley Medal.”

Horticultural Trade Journal: “Perry’s group of daylilies was a revelation; it contained over 140 varieties of which 100 were unnamed seedlings. This, so Mr. Perry stated, was the result of over 40 years intensive and painstaking work; rich yellow, dark crimsons, orange, copper, cream, primrose and flame shades were seen.”

Gardeners’ Chronicle, July 26, 1941: “Seldom, if ever, have so many daylilies (*Hemerocallis* varieties) and certainly never so many of such beauty, been shown as those arranged by Mr. Amos Perry, who filled a whole length of tabling with them. Of the many named sorts we specially admired *Bardeley*, of pale tangerine-orange colouring; *Helen Campbell*, clear yellow; *Hyperion*, lemon-yellow; *Rutilla*, reddish-brown; *Mabel Hibberson*, shaded with apricot and *J. D. Gaynor*, yellow. Along one side of the tabling Mr. Perry set out, on boards, single flowers of no fewer than seventy-five new seedlings, as yet unnamed. To those whose previous acquaintance of the daylily was simply that of a herbaceous plant useful to fill an odd corner, or to place in the shrubbery, these most delightful new seedlings must have been somewhat of a revelation, for they were of lovely shades of colour ranging from clear, sparkling yellow to rosy-ruby. Many of the flowers were larger than the catalogued sorts and possessed the added charm of broader, clearly defined “mid-ribs.” To bring such an exhibit to the show occupied probably two days’ time, but to be able to do so represents very many years of patient hybridizing, selecting AND discarding. An unusual exhibit demanded an unusual award, and this was given in a Silver-Gilt Lindley Medal, which is for exhibits of a plant or plants of special interest or beauty, or showing exceptional skill in cultivation and for educational exhibits. It is struck in bronze, silver and silver-gilt—the highest award is not lightly made.”

Gardening Illustrated, July 26, 1941: “In view of the remarks we made in Casual Commentary recently on the daylilies, it was most interesting to find that Mr. Perry had, what must have been the finest display of *Hemerocallis* ever given to the public. The exhibit comprised one hundred and twenty-three varieties, ranging in colour from the palest yellow, through tones of apricot, pinks and beige, to reds of bronzy or chocolate tones. It is now forty years since Mr. Perry began the improvement and development of this flower with two plants, and he is certainly to be congratulated on what he has achieved, and the award of a Silver-Gilt Lindley Medal—so rarely given to an exhibit—is some indication of what he has accomplished. A large number are, of course, still unnamed and show a variation not only in colour, but in shape, that is quite intriguing. Amongst the best of the named varieties was the free flowering, deep chrome-yellow *George Yeld*, with flowers six inches across; *Topaz*, a brownish-red; *Bronze Beauty*; *Semiramis*; the lovely chocolate-red *Rutilla*, and, of course, *J. S. Gaynor* and *H. fulva rosea*.”

² This refers to Britain. The first all-daylily show, National Daylily Show, was held at Orlando-Winter Park, Florida, April 18-19, 1940; the second, also at Orlando-Winter Park in 1941. —Ed.

NATIONAL AMARYLLIS SHOW, ORLANDO, FLA., 1941

WYNDHAM HAYWARD, *Florida*

Featured by an outstanding exhibit of flowers of the newer Daffodil clones shipped by air express from Oregon, the Eighth annual National Amaryllis Show of the American Amaryllis Society was held March 29 and 30, 1940, in the greenhouse of the Mead Botanical Garden, Orlando—Winter Park, Florida.

The daffodils making the 3,000-mile cross country trip were from the Oregon Bulb Farms, Jan de Graaff, president. Mr. De Graaff sent a showing of some of his choicest new clones, including a number of the rare novelties with rose and pink-colored coronas or trumpets. The exhibit received an Award of Merit.

Judges of the show were T. H. Everett, horticulturist of the New York Botanical Garden, Howard Eric, New York business man and Amaryllis fancier, who traveled from New York to Florida specially for the event and Mr. E. L. Lord of Orlando, Fla. Mr. Eric was unable to attend the full judging on the opening day of the show because of acute illness.

R. W. Wheeler of Winter Park was show manager, and received the congratulations of the hundreds of Amaryllis fans and flower lovers attending for his success in arranging a highly colorful and distinguished exhibition during a difficult period of spring weather, which handicapped the showings of a number of the leading growers in the Southeast.

Mr. De Graaff's exhibit, which was the sensation of the displays, presented for the interested examination of the show-goers a large number of white and yellow daffodils of huge size and perfect form and texture, besides the pink, orange and rose-trumpeted types. Mr. De Graaff is a member of a family famous in Dutch bulb annals, and is a conscientious and finished plant hybridizer in his own right, as his entries demonstrated.

Among the Daffodil flowers in the Oregon Bulb Farms display were *White Wedgewood*, *Royal Sovereign*, *St. Egwin*, *Asmode*, *Shot Silk*, *Eve*, *Suda*, *Beersheba*, *Eskimo*, *Robert E. Lee*, *Daisy Schaffer*, *Batavier*, *Veronica*, *Sunfirm*, *Mme. Van Waveren*, *Amourette*, *Lady Kesteven*, *Elly Ney*, *Copper Bowl*, *Octavianus*, *Seraphine*, *St. Agnes*, *Jim*, *Sublime*, *Rosabella*, *Goldona*, *Mary Copeland*, *Red Cross*, *Mrs. R. O. Backhouse*, *Actaea*. With few exceptions the blooms arrived in fresh, perfect condition, and lasted well through the second day of the show.

Besides the daffodils, the Amaryllis hybrids and species and related subjects held their powerful and colorful sway among the benches. *Asparagus plumosus* was used to bank the rows of giant flowers on both sides of the greenhouse.

Two awards of Merit were made, one to Mr. De Graaff for his daffodil exhibit, and the second to R. W. Wheeler and John Springer for their joint display of hybrid Amaryllis of the fancy Dutch types. The Wheeler-Springer blooms received two first class certificates for outstanding flowers, both large reds. The "best bloom" award in the show

also went to a Wheeler-Springer entry. First prizes for the best grandiflora collection and the best decorative collection went to Wheeler-Springer.

The Wheeler-Springer exhibit also received the following ribbon awards for individual blooms in the various color classes: first place, 34; second place 16, third place 1. Other ribbon awards were as follows: Wyndham Hayward, first place, 10; second place, 2; third place 1; Frank Nasku, first place 3; second place 6; third place 1; E. A. Peterson, second place 2; L. S. Thornton, first place 2; second place 1; W. H. Barnsley, first place 1; M. C. Varnier, first place 1, second place 4, third place 1; William Cammack, second place 2; third place 3.

VISITS TO MIDLAND GARDENS

HAMILTON P. TRAUB, *Maryland*

During the latter part of June, the writer left Beltsville by auto for the University of Wisconsin. Traveling through Maryland, West Virginia and Ohio, via the historic Cumberland Trail made famous by the tragic expedition of General Braddock, he arrived at Zanesville, Ohio at the end of the first day. The next day he stopped off at Van Wert, Ohio to visit the garden of Mr. Wassenberg. The peonies and irises were gone, but the daylilies were just coming into their prime. This suggests at once that these two excellent garden subjects should be supplemented with daylilies. Mr. Wassenberg realizes this and is building up his daylily collection. He is especially interested in the recently introduced red clones.

At day's end the writer arrived at Evanston, Illinois, and the next day he arrived at the home of Mr. and Mrs. Elmer A. Claar, at Wilmette, Illinois, where he spent two most enjoyable days. At the Claar home he found a numerous collection of daylilies. Although it was at the beginning of the season, several fine clones were in bloom. Some of Mr. Claar's seedlings were also in bloom and they looked quite promising. Various gardens in the vicinity were visited, including the one of Mr. David Hall, who is doing some excellent daylily breeding work. The Garfield Park Conservatory was visited where he met Mr. Van Tress who, in cooperation with Mr. Koch, originated the outstanding Garfieldii hybrid amaryllis that are among the best of the forcing clones. Mr. Claar gave a private showing of his excellent technicolor movies of daylilies, irises and peonies. This was a real treat.

After a profitable two days at the Claar home, he set out for the University of Wisconsin and arrived at Madison the next day at noon. In traversing six states on his way from Beltsville—Maryland, West Virginia, Ohio, Indiana, Illinois and Wisconsin—he noticed the *Fulva Europa* daylily all along the route with only hollyhocks as a rule to keep it company. This again emphasizes the outstanding value of daylilies in American landscape plantings. Later in August, the chief attraction at Madison was the array of *Hosta* species that were at their best in total or partial shade.

In late August, the writer set out for home, but stopped over for a day at Milwaukee, as the guest of Mr. Hammersley, a good friend of the Society. He had the opportunity of seeing at close range the very excellent park system of the County and City of Milwaukee in company with Mr. Hammersley and Mr. Boerner, the park superintendent. The writer was especially impressed by Milwaukee County's Whitnall Park Arboretum. This is indeed an ideal place for one of the Society's trial gardens.

The writer had hoped to visit again at the Claar home, but unfortunately the time was too short, and he turned his course due East, and he reached Canton, Ohio on August 25, and the next day, via Pittsburgh and the new Pennsylvania Turnpike (speed limit 70 m.p.h.) he reached Beltsville in the late afternoon.

AUTUMN AMARYLLIS SHOW, POMONA, CALIF., 1941

CECIL HOUDYSHEL, *California*

The National Autumn Amaryllis Show at Pomona, California, was held as usual in conjunction with the Flower Shows at the Los Angeles County Fair in the Agricultural Hall.

Agricultural Hall was a steel and concrete structure, 800 feet long and 135 feet wide. The roof was supported by steel cross beams. There were no supporting pillars within the floor space to intercept the view.

In the center was the Lily Pool. Along the sides of one end were the displays of the citrus Associations. In the center of this end were displays by various counties and communities as well as by individual nursery firms. The space from the Lily Pool to the main entrance housed the Floral Exhibits with several exhibits of gardens by nurseries who do landscape work ranged along the sides.

The dates assigned to the Amaryllis Show were Sept. 18 and 19. We were especially fortunate in having for Judge, Mrs. Maria Wilkes who has lived for years in Italy, South Africa and Southern California. She has studied amaryllids in their habitat and in the places where they are commonly grown. In her judging she showed exceptional discrimination, and unerring ability to select the best.

The Amaryllis exhibits occupied a table about 75 ft. by 6 ft. There were about 100 entries.

Only the most outstanding exhibits can be mentioned. The most outstanding of all was presented by the Las Positas Nursery of Santa Barbara. This was a vase of three huge stalks of *Haemanthus Katherineae*, in perfect form. They showed a fine vase of their new hybrid *Nerine*, *Chameleon*, another of mixed hybrid nerines, two *Bomarea* species and others of special merit. Las Positas with only eight entries, won seven firsts and one second.

Mr. J. N. Giridlian, Oakhurst Gardens, of Arcadia showed the rare *Agapanthus pendula* with lovely deep purple pendulous flowers; *Amaryllis aulica*; *Hymenocallis Daphne*, and others. Mrs. Leonard Swets of Riverside showed beautiful flowers of *Vallota purpurea* in perfect form

and of superior size and color; a fine *Crinum* hybrid, *Amaryllis aurica* and others. Prize winning exhibits were also entered by Mrs. Leonard Slosson of Los Angeles and Mrs. Norma E. Cooper of Ontario. We entered about 40 species and varieties.

The Sweepstakes First Prize of \$25.00 was awarded to the writer. We won 21 Firsts, 8 Seconds and 1 Third. The Second in Sweepstakes and \$20.00 was awarded to Mrs. Leonard Swets of Riverside with 9 Firsts, 5 Seconds and 1 Third. The Third in Sweepstakes with \$15.00 in prize money went to Las Positas Nursery of Santa Barbara. The Fourth in Sweepstakes and \$10.00 was awarded to J. N. Giridlian, Oakhurst Gardens, Arcadia. The Fifth place with \$5.00 was won by Mrs. Leonard Slosson of Los Angeles.

Much interest was shown by visitors in the amaryllid exhibits. Several stated they were the most educational of all floral exhibits. The Fair was attended by over 800,000. It is probable that nearly 100,000 saw our exhibits.

We regret to record that the beautiful Agricultural Hall was destroyed by fire the morning following the close of the Fair.

2. COLOR DESCRIPTION

COLOR PHOTOGRAPHY AND THE AMARYLLIDS

WYNDHAM HAYWARD, *Florida*

Color photography is a distinct art in itself, which has come within the reach of every flower lover in recent years as the result of the development of the miniature camera and color film at popular prices.

Photographing Amaryllis flowers and the blooms of all the vast number of related genera and species has proved a fascinating hobby for many amateurs, and an essential professional sideline for garden club lecturers, authors on garden subjects, and bulb specialists in general.

The popular Kodachrome color film in the 35 millimeter size is used by the average amateur and professional, although larger sizes of Kodachrome may be used with other cameras in the hands of expert photographers. This color film is a product of the Eastman Kodak Company of Rochester, N. Y., and is processed or developed by the manufacturer, to which the films are sent by the photographer after exposure.

The 35 mm. Kodachrome film may be used in any good "miniature" or "candid" type camera constructed for this purpose. Suitable cameras may be purchased in a number of makes at prices from around \$25.00 to \$500.00 or more. For \$50.00 or slightly less an excellent 35 mm. camera may be obtained that will give reasonably satisfactory results for the amateur.

For the beginner, the only additional equipment that is recommended would be a tripod and a portrait or "close-up" lens. The extra lens is required for special pictures desired at short distances. A tripod is helpful, but not absolutely necessary for good results. It enables the photographer to maintain the camera absolutely steady while taking color pictures, an important factor, as the color film is a "slow film," requiring a wider lens opening and a slower shutter speed than most ordinary black and white snapshot films.

Bright sunlight is an essential for taking good Kodachrome pictures unless special compensations for less light are provided. As this discussion is intended solely for the amateur, no mention will be made of such factors as color screens, filters, reflectors, flash bulbs, etc.

The flowers to be photographed may be arranged in a vase, or pictured just as they grow in the garden, or in a pot. The directions for regulating the camera for lens opening and shutter speed should be studied carefully, as regards various lighting. A light-meter will be a valuable aid in this regard, although not absolutely necessary for the beginner. The writer has found in Florida that most flower pictures in Kodachrome will come out well if taken in full sunlight, preferably from 10 to 11 o'clock in the morning, and from 2 to 3 o'clock in the afternoon, with a shutter speed of 1/50th. second, and a lens opening of 4 to 6f. In less light, the shutter speed may be slowed to 1/25th. of a second, and the lens opening increased to 2.9f.

Actual practical experience is the best instructor in acquiring a knowledge of 35 mm. color photography. A few rolls of the film will

usually be sufficient to acquaint the amateur with the best results that may be obtained in the technical setting of the camera lens opening and shutter speed. The portrait lens will permit close-up pictures of small flowers, up to a foot away, or even closer in the case of high priced equipment.

The loading and unloading of Kodachrome films in the ordinary miniature camera presents no problem to the ordinary amateur, and can be learned in a few minutes, along with the fundamentals of operating the camera. The light-meter will provide a ready guide for the best settings of lens and shutter in most cases, although rule-of-thumb procedure can be worked out by the individual with a little practice.

The films of Kodachrome are sealed and sent to the manufacturer for processing, and are returned in a few days in the finished state. Duplicate films may be obtained from the manufacturer, and color prints from the films, which latter are actually color transparencies, are also available from a number of processors. These color prints, when made from good transparencies, are brilliant and effective, although not all color film negatives will make good pictures. The cost of the color prints may be from 75 cents to \$25.00 or more, depending on the size and quality of the work.

The 35 mm. films themselves are roughly a little more than an inch square, and are usually quite satisfactory for viewing in ordinary daylight, when held up to the bright sky, or when shown on a screen in the dark from a projection machine. There are also small portable viewers which show the film enlarged and lighted from behind.

Even to the most blasé "black and white" photographer, the use of color films, especially in the photographing of beautiful flowers will bring a new thrill of pleasure and excitement. Hardly any other hobby, for so small an investment, can deliver such soul-satisfying ecstasy as the color camera in the hands of the ardent garden and flower enthusiast, with all of the artistry and practical significance that the individual cares to apply.

Every commercial grower knows the despair of trying to describe the bloom of a new or rare bulb or herbaceous plant to one who has never seen it. By the use of a single color film transparency, the problem is solved, and the particular flower is captured for all posterity to see. This is especially valuable for both amateurs and professionals who wish to preserve for their friends and customers the full beauty of one or more of their most choice specimens!

3. DESCRIPTION, CLASSIFICATION AND PHYLOGENY

VISITS TO GARDENS OF DAYLILY ENTHUSIASTS, 1941

ELMER A. CLAAR, *Illinois*

I still feel in the year 1941 as I did in the year 1940 that my notes and observations are highly presumptuous and I again wish to issue a few personal notes of warning to anyone who reads anything I write about flowers. I have some very definite prejudices about bloom and color. These will very likely be reflected in my notes.

Once again my observations about daylilies must be taken as from one who has seen only a few of them. One person cannot see all the new daylilies under present conditions. I missed many fine new ones and I have seen other fine things at a disadvantage. I had to hurry from garden to garden which is not conducive to thorough study. Also with my limited experience as a gardener and limited knowledge as a botanist, color specialist, entomologist, chemist, soil specialist, and at least thirteen other major subjects relating to daylilies, I reserve the right, upon acquiring additional facts and information about any one of these subjects, to change and amend anything that I say either now or hereafter about any of these subjects.

In the middle of July I took a trip to Nebraska to see the daylily gardens of the Sass brothers, and later during the same month I went to New England, New York, Washington, Maryland, and Ohio. At Lowell, Mass., I again saw the Fairmount Gardens of Mr. and Mrs. Nesmith. At New York I again saw Dr. Stout's work at the New York Botanical Gardens. At Hyattsville, Maryland, I saw Prof. J. B. Norton's daylilies. At Beltsville, Maryland, I saw Dr. Traub's daylilies. At Chevy Chase, Maryland, I saw Mr. J. Marion Shull's daylilies. At Dover, Ohio, I saw Charles Betscher's daylilies. At Wilmette, Illinois, I saw Mr. David Hall's and my own daylilies.

Visit with Sass Brothers. I first went to Nebraska to those plant wizards, the Sass brothers, Hans and Jacob Sass, who have been hybridizing various kinds of flowers as a hobby for years. They have been so successful with iris that they have won the Dykes Medal, the highest award given by the American Iris Society, twice. This year Jacob Sass' *Red Douglas* won the Dykes Medal, and Hans Sass' *City of Lincoln* won second place. I would rather have Jacob Sass' new *Golden Fleece* than any other iris that I am growing, or in fact, that I have ever seen. The American Peony Society this year has issued a new rating of peonies and among the highest rating you will find the Sass peonies, *Elsa Sass*, *Evening Star*, *Nebraska*, etc. Several individuals who are connoisseurs of Oriental poppies have told me that the Oriental poppy *Aksarben*, a Sass creation, is the largest and one of the finest that they know. This name was created by spelling Nebraska backwards.

Their wizardry is again demonstrated in daylilies. Jacob Sass has done no hybridizing of daylilies up to this time, but he said that the Sass theory of hybridizing is "to make a lot of crosses, thousands, and select the best seedlings and recross them." Through the process of hand pol-

lination and selected straight line breeding Hans Sass has, from *Hemerocallis citrina* and the Great Orange Daylily, *H. aurantiaca* var. *major*, which he bought from the Park Seed Company of La Park, Pennsylvania in 1908, created some of the best yellow daylilies available today. Hans says he believes the Great Orange Daylily is the true *H. aurantiaca* var. *major*, but Dr. Stout to whom he sent a plant claims it is not the true clone as it is slightly smaller.

I was already growing all of the daylilies introduced by Hans Sass, but I wanted to talk to Hans, Jacob, Henry, and all the rest of the Sass family and see their introduced varieties and seedlings in their home garden. It was Sunday when I arrived and I was fortunate enough to be able to spend the entire day with them. The plantings were in different places on the Hans Sass farm. He must have several acres of daylilies—literally thousands. I took a couple of hundred feet of Kodachrome moving pictures comparing various daylilies. I took pictures of Elsa Sass, Hans' wife, holding *Golden West* and seedling No. 67-40 for comparison, and pictures of Jacob and Hans standing beside daylilies that were two feet taller than they are. I took pictures of Henry Sass, one of Jacob's sons, comparing *Patricia* and *Hesperus*. I took pictures of Hans and Henry Sass comparing five daylilies, blooms of which I personally selected to satisfy myself that they were typical and growing under similar conditions. Here were: *Hyperion*, *Star of Gold*, *Hesperus*, *Patricia*, and *Moonbeam*. If you like a large star-shaped yellow, *Hesperus* will please you. The Sass folk believe it is their best. If you like a small flower with overlapping segments, you will like *Patricia*. We compared and photographed *Hesperus* and seedling No. 45-40, *Hesperus* and *Patricia*, *Patricia* and *Moonbeam* and seedling No. 82-40. The light cream *Moonbeam* is lovely. I shall soon see it blooming as a typical plant besides Mrs. Nesmith's lovely cream *Starlight* and Mrs. Popor's (Port Rose Gardens) *Old Ivory* in my own garden. All the Sass daylilies are yellow-colored. Hans Sass' introductions from the lightest to the deepest coloring, as selected by Henry Sass and myself, are: *Moonbeam* and *White Lady*, very light, *Sunny West*, *Golden West*, *Star of Gold*, *Hesperus* and finally *Nebraska* which is a cadmium yellow.

Hans Sass likes star-shaped daylilies. Therefore, you will find nothing but star-shaped daylilies in his introductions. Another characteristic that he emphasizes is floriferousness. It would be well if more of the hybridizers were to emphasize this quality. Although *Hesperus* is a large flower, many of the individual scapes had fifty or more flowers on each scape with many scapes on each established plant. This, of course, makes for a long blooming period and increases the desirability of the flower very much. *Hesperus* is the best daylily from the point of view of floriferousness that I have seen.

Henry Sass is interested in daylilies and is going to start hybridizing them. I predict that he will carry on the Sass tradition in a manner that will make both Jack and Hans proud. I did not meet the other Sass brothers for they were in the Army.

Before I went there I thought I would not care if another yellow daylily were ever introduced, but they had seedlings in yellow that would

make even me unhappy if they were not introduced. The one that most appealed to me is 45-40, a big flower with a clear color and overlapping segments, fuller but somewhat similar in shape to *Pink Charm*. It is definitely superior.

There is so much work to be done in acquainting the public with the new colors in daylilies, that when I returned home I sent the Sass brothers pollen from some of the rare reds, purples, raspberries and pink daylilies. I later sent them plants of a number of the rare colored clones. They were kind enough to send me all of their peony introductions that I was not already growing.

If I were to select only ten yellow daylilies from among the many that have been introduced I would have the Sass' *Moonbeam*, *Hesperus*, and *Golden West*. *Star of Gold* is also very good and so is *Nebraska*. I do not care much for the form of *Sunny West* but it is a prolific bloomer and very late. *White Lady* is a very light yellow-colored flower but smaller, and seemed to me the least desirable of all of their introductions. The Sass daylilies within their respective color range are superior daylily introductions, and culled from the thousands of Sass seedlings, they represent a tremendous amount of intelligent and careful work.

Dr. Stout's Seedlings. I visited Dr. Stout in July, 1941. He does not want any of his seedlings described or photographed before their introduction, inasmuch as this causes correspondence and inquiries that he does not have time to handle. Dr. Stout must have an acre or two of daylily seedlings back of the conservatory. I am growing all of his plants so far introduced. They are very superior and I shall always buy anything offered by Farr and Company who sell all of his introductions.

Dr. Stout is not only a pioneer daylily hybridizer, but he is one of America's most distinguished botanists. The beautiful clones *Rosalind* and *Chengtu* were secured from China through the special contacts of Dr. Stout and the New York Botanical Gardens. His red introductions, *Wolof*, *Vulcan*, and *Theron* are all fine. Dr. Stout's bicolor *Festival* I like as well as any bicolor I have seen. *Linda* is a wonderful flower. *Patricia* is a trim little yellow with wonderful form but the branching could be improved. This year he introduced 20 new clones. I have all of them but have not seen any of them in bloom.

Fairmont Gardens. I was thrilled again this year at Mrs. Nesmith's Fairmont Gardens, Lowell, Massachusetts, when I saw the marvelous daylilies *Honey Red Head*, *Royal Ruby* and seedling No. 39-345. None of these have been introduced. *Honey Red Head* is a lovely flower with very good form—a golden throat, red segments with a prominent white strip down the center and a light edge around all of the segments. It's a honey. *Royal Ruby* is a marvelous flower. It has an intense glowing color that will be much sought after when the supply is large enough to introduce. I am growing it near Plouf's *Craemore Ruby* and Ralph Wheeler's *Ruby Supreme*. I am anxious to see how they compare. Seedling No. 39-345 is one of the very best of the new things that I have seen. It is a rich maroon color with a very white strip down the middle of the petals. I should like to compare it with Mr. Hayward's wonderful red *Emperor Jones* if they both bloom for me next year.

“*Gay Troubadour*” impressed me as one of the best bicolors. The sepals are a frosty maize yellow and the petals are bright Indian or cherry red, making a stunning contrast. Some day we will have a flower like this with better form, but to date I have not seen one so I bought it. It definitely shows its *Byng of Vimy* ancestry. *Dawn Play* is one of her very fine plants and in my yard it seemed similar to Dr. Traub’s *Wekiwa*. *Milady* seemed similar to Dr. Stout’s *Charmaine*. It reminds one of *Rosalind* with the deep rose throat removed. *Purple Elf* is a striking flower. It is a small maroon purple almost black with recurving segments. It must have *Hemerocallis multiflora* blood in its makeup. *Pink Charm* is a very fine pastel-colored flower with fine form. Mrs. Nesmith’s seedling No. 39-185 reminds me of *Circe* except that it is deep purple. *Morocco Red*, and *Purple and Gold* were fine. I didn’t see *Royalty*, *Bold Courtier*, *Petra*, *Persian Princess*, or *Sweetbriar*.

Of her introductions this year I thought *Black Falcon* was outstanding. In fact, it was the most impressive of all of the introductions that I have seen bloom this year. It is really a very deep purple. It is very large and has good form, which is unusual for a flower of this color. *Su-Lin* will especially appeal to the ladies. It has very delicate pastel coloring. The petals are light pastel pink which Mrs. Nesmith calls orchid. The sepals are a light yellow which she calls Chinese. It is a distinct color break. I have a seedling which looks very similar to it. I was disappointed with the form of *Torobred*. It may be that the flower I saw was on a plant that was too young. *Highland Chieftain* and *Piquant* are fine flowers whose color impressed me as leaning toward raspberry. I was disappointed in *Matador* for I expected it to be a deeper color, but Mrs. Claar and Mrs. David Hall both liked it, and of course there is a light-colored mahogany.

I purchased the following seedlings which I thought worthwhile: 41-119—a lovely burnt orange; 41-122—a multiflora with tubular segments and a peachy pink coloring; 41-125—I liked this very well; it is a pastel pink or faint fulvous coloring with recurving tubular segments; 41-133—it has deep dark red coloring and the petals have a white midriff most distinctive; 41-32—an impressive fire-red flower.

If I were asked to select the finest unintroduced seedlings that I have seen in bloom and were limited to ten, I certainly would include *Honey Red Head*, *Royal Ruby*, and seedling No. 39-345. I would also place *Black Falcon*, which was introduced in 1941, as very desirable. It must be remembered, however, that I have not seen in bloom many of this year’s introductions: none of Dr. Stout’s although I am growing all of them, and none of Dr. Traub’s and Mr. Wheeler’s although I am growing many of them.

Washington, D. C. and Vicinity. From Mrs. Nesmith’s I went to Washington, D. C. Mr. J. Marion Shull was kind enough to take me around the various daylily gardens in the suburbs of Washington. At the U. S. Horticultural Station, Beltsville, Maryland, we went to see the seedlings of Dr. Traub (on leave of absence at Wisconsin for the summer) who had moved 20,000 seedlings from Orlando, Florida, to Beltsville, Maryland. He has donated the surviving 20,000 seedlings to the U. S.

Department of Agriculture, and any seedling selected for naming from this lot will be introduced by the Department. I was late for this planting and saw only a few in bloom. I am growing nearly all of the seedlings that he has introduced but have seen only a few in bloom. I especially liked his *Wekiwa*. I saw the last bloom of his *Dr. Stout*. However, Mr. Shull said he did not think this one was a typical bloom.

At Mr. Shull's I saw the last bloom of *Musette*, one of Mr. Shull's introductions. It has good clear coloring and is exceptionally large.

From there we went to Prof. Norton's garden. Prof. Norton is connected with the Agricultural College of the University of Maryland. He has been hybridizing daylilies for some time. He sent me most of his introductions this year but I have not seen them in bloom. I was disappointed not to find Prof. Norton at home. I saw his *Mongol* in bloom and it was a gorgeous big yellow daylily in its home garden. I shall be glad when I can compare it with *Hesperus*, *Musette*, and orange-colored *Majestic*. I did not see his *Takoma*, *Mary Webster*, *Melo*, *Prince William* or *Woodridge* in bloom, but I am growing them so I will report on them later.

It is interesting to note the difference in blooming conditions in this district. At the U. S. Horticultural Station at Beltsville the plants were all through blooming. This was a typical planting such as you would find on corn land on a farm. The daylilies of Mr. Shull were through blooming with the exception of one flower, *Musette*. His garden is a typical city garden with trees, etc. Prof. Norton's garden is situated on the side of a beautiful ravine, and although only a few miles from these other growers, it seemed to me that his flowers were at the peak of their bloom.

Visit with Mr. Betscher. From Washington I went to Carl Betscher's at Dover, Ohio. He has, I would estimate, eight acres blooming in an open field. They are all yellows and oranges with very few of the fulvous type, and I saw no reds, pinks, raspberries, etc. I arrived at a time when the daylilies were in full bloom so this large mass planting made a very impressive sight. I had a great deal of pleasure in looking over these plantings and talking to Mr. Betscher. After looking through his seedlings, I believe that among the summer bloomers the plant I like best of all is *Anna Betscher*. This is also his choice. His *Earlianna* is the best early blooming flower that I have seen. It blooms at the time of the iris. His *Glorianna* is the largest intermediate orange that I have seen. If I had to select the three finest flowers in Mr. Betscher's garden it would be these three. Inasmuch as I did not see any red, pink, cream, purple, or raspberry daylilies, when I returned home I sent him some pollen from these types.

Millroad Gardens. In Chicago the Millroad Gardens, just outside of Lake Forest, has quite an extensive planting of daylilies in charge of Dr. E. J. Kraus of the University of Chicago; it must be over an acre but I did not see any of the newer varieties, with the exception of *Sunny West*.

David Hall Gardens. Mr. David Hall, my fellow-townsmen of Wilmette, Illinois, had over a thousand daylily seedlings last year and he discarded all but three. He had one plant which I can describe best by saying it is an improved *Taruga*; this seedling Mr. Hall says bloomed over

two and one-half months for him. Two years from germination this plant, seedling *No. 39-2*, sent up 13 scapes. The petals are long, smooth, narrow, and noticeably twisted and pinched at the end. The color as compared to *Taruga* is a deeper yellow. Another of his seedlings, *No. 39-30*, is a full round flower of a deep rich yellow with a velvet finish and very wide petals. It has unusual substance. It is not overly-prolific but it is a fair doer. His seedling *No. 39-7* is a full round flower, heavily ruffled, medium yellow, exceptionally well branched. Among his 1941 seedlings the one I liked best is his seedling *No. 41-05*, a very vigorous plant 54 inches high with blooms 8½ inches across. It is a rosy-red bicolor. The petals are long and twisted. The sepals are rosy-red and the petals yellow with an overflush of pink. It bloomed in late August. It is shaped like *Rosalind* but much larger. Seedling *No. 40-03* is a combination of yellow and pink. *No. 41-05* and *No. 40-03* are both *Rosalind* seedlings.

My own seedlings. Among my own seedlings I saw a number of new things which agreeably impressed me, but heeding Mr. Lasman's warning that "*each breeder is apt to think his duckling is a swan,*" I have decided to wait at least another year before describing any of them.

RANDOM OBSERVATIONS AND DESCRIPTIONS OF DAYLILIES

J. MARION SHULL, *Maryland*

An opportunity to observe daylilies blooming out of season in the greenhouse during the past winter, and to compare them with the same varieties blooming in their normal season out-of-doors, was afforded by material brought by Dr. H. P. Traub from his Florida plantings for re-establishment at Beltsville, Maryland in the autumn of 1940. Under the double abuse of out-of-season planting and subsequent severe drouth it has not been possible to carry on observations on the extensive scale originally projected, but enough material blooming under glass during February to April was paralleled by field-grown specimens of the same varieties blooming in July and August to warrant recording here.

By and large it may be said at once that no significant differences of color were found as between flowers of the same variety winter-grown under glass and those blooming in the summer garden. In fact such differences as were recorded were not greater than occur from day to day in the same plant in many varieties.

Daylily flowers fluctuate from day to day within narrow ranges both in color and size though the reason for such fluctuation is not always apparent. Size may be influenced by several factors such as soil moisture, temperature, kind and duration of light, all of which are unpredictably variable. What affects the color, bright one day and muddy another in some of the blends; brighter some whole seasons than in others, is more obscure and would be difficult to determine with any certainty. More than that there may be regional variation by reason of climatic and soil differences whereby a variety may be highly meritorious in one and relatively worthless in another region, and so the following notes and descriptions will not attempt to say of a variety it will do thus and so throughout our wide flung country—only that it appeared thus and

so in my garden at Chevy Chase or as seen in the field at Beltsville, Maryland, and at the particular time of observation.

I have had an opportunity to see a number of newer things, mostly from the productions of Dr. Traub, a few of which I shall describe in some detail concerning the flower though many were not yet well enough established to warrant report on stem and foliage characters or general habits. But before I report on these newer things let me say that I am not disposed to disparage older varieties merely because they are old and have become abundant and widely distributed. In my garden, located on the edge of the piedmont, such older varieties as *Ophir* and *Sir Michael Foster* are still among the finest yellows to be had. *Calypso* too, despite its night blooming, is a fine thing forenoons and evenings, and of course for taking into the house at night when most daylilies are quite useless.

FULVA ROSEA ROSALIND I have had growing under unusual circumstances, first transferred from greenhouse to garden in early May while in bloom and thus affording pollen for mating with *H. Middendorffii* and *H. minor*. The same plant then brought a second flower stem in September and is still blooming in mid-October as these notes are being written.

Using Ridgway "Color Standards and Nomenclature" *Rosalind* may be described as petals Jasper Pink and sepals Jasper Red, with moderately conspicuous eye-zone of Nopal Red surrounding a relatively small throat area which is more green than yellow. Form somewhat irregular, sepals much recurved, petals not. Petals twisty with curled or crimped margins. Filaments go from light green at base through yellowish to petal color in outer third. Reverse of flower light greenish at base, passing through Light Ochraceous-Buff to Orange-Vinaceous in broad petal margins.

In description of certain varieties the reverse color is of great importance but this will be discussed in more detail in connection with such varieties as *Emperor Jones* and *San Juan*.

DR. STOUT. Ground color Cadmium Orange overlaid and flecked with Brazil Red. Eye-Zone also Brazil Red but more closely applied, is not very conspicuous. Throat Orange becoming greenish at center. Filaments Orange. Petals show a fairly prominent Deep Chrome midrib. Reverse solidly Capucine Yellow. Segments much recurved.

VICTORY TAIERHCHWANG is practically a red self. Ground color is Nopal Red and Garnet Brown with the eye-zone only slightly darker to Van Dyke Red and not conspicuous. All six segments display contrasting midribs of the throat color, which is Deep Chrome. Throat greenish toward the center. The regularity of this flower, with the radiating midribs, presents a starry appearance that is very pleasing. A handsome flower of only medium size but is reputed to be very free blooming.

GEORGE KELSO is a bicolor in which the outer half of petals is Mars Orange to Burnt Sienna with conspicuous yellow midrib. Prominent eye-zone is near to Garnet Brown. Sepals are Empire Yellow slightly overlaid with streakings of Burnt Sienna. Throat Greenish Yellow to Empire Yellow next the eye-zone. Filaments are Deep Chrome; pistil

lighter. A very striking flower with a spread of $5\frac{1}{2}$ inches, somewhat recurved. With petals $4 \times 1\frac{1}{2}$ inches and sepals 4×1 inch there is good fullness and the reverse color all Empire Yellow gives a pleasing color mass not always to be found in bicolors.

CECIL HOUDYSHEL. A star-shaped self of medium size. Color mostly Dragon's-Blood Red deepening slightly to a hardly noticeable eye-zone of Pompeian Red. Sepals are narrowly margined yellowish corresponding to the Light Orange Yellow of the reverse. Throat is small, greenish Light Orange. Filaments bronzy in outer three-fifths. Style pale yellow.

WEKIWA is a near self with Brazil Red petalage and Capucine Yellow throat. Eye-zone darker to about Garnet Brown but is not conspicuous. Flower wide-spread to $5\frac{1}{2}$ inches, somewhat irregular as in its parent, *Waubun*. General effect is orange red. A rather bright and cheery color.

CORINNE ROBINSON, a pinkish salmon self of good size, 5 inches across, slightly irregular with the upper portion well recurved. The Congo Pink of petals and Flesh-Ochre of sepals are so closely related that for practical purposes the flower is a self. Throat is Empire Yellow deepening to Sulphine Yellow at center. Throat color extends to about the center of petal where it becomes an inconspicuous midrib only slightly lighter than the petal body color. Veining on petals is a trifle darker than Congo Pink but is delicate and unobtrusive. Filaments greenish at the base, then yellow of the throat, passing gradually to petal color near the anthers.

Flower star-shaped, petals $3\frac{5}{8} \times 1\frac{1}{8}$ inches; sepals $3\frac{5}{8} \times \frac{5}{8}$. Reverse of sepals and median portion of petals about Antimony Yellow. Petal margins stained through to near Pinkish Cinnamon. A very attractive soft color, the general effect being a little on the pinkish side of salmon.

FIRE RED. Grenadine Red in outer portion. Brazil Red eye-zone. Petals with strongly marked orange midrib. Throat orange to greenish, not large. Reverse Orange to greenish at base, filaments rufous in outer half, pistil only slightly so. Flower rather irregular and considerably recurved. General effect deep reddish orange somewhat deeper toned than *Rajah* but with much less prominent eye-zone.

SAN JUAN, a Morocco Red self varying lighter and darker to Garnet Brown but a somewhat livelier color than these as presented in Ridgway.

There is no definite eye-zone but there is a lighter though not conspicuous midrib. Throat Wax Yellow through Greenish Yellow to Yellow Green at center. Filaments the same except that the outer third is tinged with petal color. Reverse Empire Yellow with Morocco Red stained through toward the margins, greenish at base. Flower is therefore very definitely two-faced as in *Radiance* rose, entire outer or reverse surface predominantly yellow and in strong contrast with the rich red face. Flower 5 inches across, well recurved and nearly regular. This is possibly the best red to date though owing to reduced yellow pigment the light green throat is in almost too great contrast with the deep red surrounding it.

Seen from behind, the flower is not an effective red and for this reason will best be planted up against border shrubbery or a wall so that all flowers will naturally turn in one direction and toward the observer. This planting note is equally cogent with such other double faced varieties as Hayward's *Emperor Jones* with its very deep brownish, almost purplish red.

EMPEROR JONES, originated and introduced by Wyndham Hayward, is mostly Victoria Lake, a dark brown-red, to about Ox-blood Red at margins. There is a prominent midvein which extends the Deep Chrome of the throat to the apex of the petals but only faintly present on sepals. Extreme center of throat is greenish. Filaments are Deep Chrome to near Sanford's Brown in outer half. Reverse of petals shows a center stripe of Light Cadmium broadly margined with near Burnt Sienna. Sepals Orange overlaid with Burnt Sienna. Petals $3\frac{1}{2} \times 1\frac{1}{4}$ inches; sepals $3\frac{1}{2} \times 1\frac{3}{16}$ inch. Flower somewhat irregular, much recurved. From behind it is brighter than *San Juan* but is also only really effective when seen from the front and should be planted to secure this point of view.

FRED HOWARD presents a different aspect from most varieties carrying the same or similar colors. The throat is not so definitely delineated. It is greenish at center to Lemon Yellow. This throat color passes almost imperceptibly to an overlay of Orange Rufous gradually deepening through Mars Orange to nearly Mahogany Red at petal tips. Sepals follow the same order but are not quite so deep toned. Both petals and sepals have a rather broad but not very sharply defined midrib of the underlying Lemon Chrome. Reverse of flower is lighter but also shifts very gradually from the greenish base to Antimony Yellow and near Tawny.

RUSSELL WOLFE is another of the double faced varieties, somewhat larger than *San Juan* but not quite as dark, and the transition from throat color, which is Lemon Yellow with green in the center, to the outer portion of the flower is less abrupt than in *San Juan*. It may be classed as a nearly red self; petals Brazil Red to near Ox-blood Red. Sepals Dragon's-blood Red with yellow underlay. Reverse of sepals is Apricot Yellow at tips lightening to Baryta Yellow and tinged greenish toward the base. Petal reverse, yellow as in the sepals but broadly margined Garnet Brown. Flower wide-spread, somewhat irregular, with eye-zone hardly noticeable.

My notes indicate this variety as an early quitter, perhaps partly night blooming. By mid-afternoon the flower was appreciably spent while *Indian Chief* and *San Juan* were still in prime condition.

ROUGE VERMILION. Nopal Red varying slightly lighter and darker with moderately conspicuous eye-zone of near Garnet Brown. Throat and base of filaments about Pyrite Yellow (greenish) and outer part of filaments near same color as segments.

Outer aspect of the flower is greenish yellow at base passing to yellow in middle portion of segments but margined Carnelian Red, broadly on reverse of petals, narrowly on sepals. Segments $3\frac{1}{2}$ inches long but narrow. Petals $\frac{7}{8}$ inch wide and sepals scarcely over $\frac{1}{2}$ inch. Sepals

are much recurved, petals only slightly so, with the lower one strongly projecting, resulting in a decidedly triangular face. A bright cheerful red of medium size and near self.

GOLDEN GLOW. Though Dr. Traub's chief interest in reds and in pastel colors has been amply indicated in those of his introductions already described, varieties wherein red of one sort or another is a dominant constituent, the story would be incomplete without including a couple of outstanding things not in this category. *Golden Glow* is a fine yellow self of very heavy substance. The color is Light Cadmium Yellow with flashings of Cadmium Yellow, the exterior or reverse essentially the same. Expanse 5 inches. Petals broad, $3\frac{3}{4}$ x $1\frac{5}{8}$ inches, somewhat twisted toward the apex. Sepals $3\frac{3}{4}$ x $\frac{7}{8}$ inches, much recurved but not twisted. This gives the flower a decidedly triangular cast as seen from the front. While *Golden Glow* is in a color field where there is intense competition it is nevertheless outstanding by reason of fullness of flower and heavy substance.

THEODORE MEAD is a little deeper in color than the preceding, a very intense self between Cadmium Yellow and Orange. Both petals and sepals are long and twisty and of very heavy substance. A very interesting novelty, quite irregular in form or even bizarre. Longest measurement as naturally standing 6 inches to tip of long-thrusting lower petal.

* * * * *

Another year it is hoped that all these and many more may be seen in fully established growth that will supply dependable data on foliage and stem characters as well; also relative time of blooming, all of which had to be passed over for the current year. Then it should be possible to fill out complete data cards for permanent record.

SOME DAYLILIES I LIKE

DAVID F. HALL, *Illinois*

In writing this article I wish the readers to understand that I have not by any means seen all the good daylilies in commerce or many of the fine ones as yet to be found only in hybridizers' gardens. I wish also for them to bear in mind that we differ, sometimes widely, in our likes and dislikes of daylilies as well as many other things and I can only choose those I have seen and that appeal to me.

I have been breeding iris for the past twelve years and found quite a gap between the end of the iris blooming season and fall. In looking around for something to fill in I chose the daylily as offering alluring possibilities for improvement. It has charm, hardiness, easiness of culture and is useful in gardens in all sections of the United States. I do not know of another beautiful flower that can be successfully grown in Florida, Minnesota, Southern California, and Maine without special attention and care.

YELLOW DAYLILIES

There are so many yellows on the market which are so similar that it is difficult, and in many cases impossible, to distinguish between them. However when we consider the great increase in demand for daylilies and the fact that they increase slowly in comparison with most perennials this flood of yellow introductions may be useful in making our gardens colorful and cheerful until there is available in sufficient quantities and at low cost a dozen or more of the finer ones. The less desirable ones will then gradually fade from the picture.

I do not feel that we have all time daylilies in any color class. Hybridizers are developing better flowers right along and undoubtedly will continue to do so long after we have sprouted wings. There is not only a great range of colors not yet attained, but also better stalks, substance, texture, ability of flowers to last throughout the day without fading, and better branching, resulting in more flowers to a stalk, are in the offing.

I believe many hybridizers have not placed enough emphasis on good branching. Many daylilies producing very attractive flowers are poorly branched—with better branching they would produce more flowers and in many cases continue to bloom over a longer period of time.

I have a yellow seedling that is exceptionally well branched and produces up to fifty-four flowers to a stalk. They measure seven inches across, and have a very attractive golden yellow color but by noon the flowers have faded to an unattractive shade and it therefore has no commercial value. But hybridizers will undoubtedly shortly produce clones with similar branching and number and size of flowers in attractive colors that do not fade badly.

Hesperus (Sass) is my favorite yellow. It is a bold, free blooming, very large flowered medium yellow, well branched and carrying many wide petaled semi-flaring flowers, on stalks forty-five inches tall that do not require staking.

Nebraska (Sass) is my second choice. It also has large open flowers on forty inch stems. The color is Cadmium yellow with an apricot flush.

Golden West (Sass) is about the size and color of *Ophir* (Farr) with a more open flower, on a much better branched stem and carries many more flowers than *Ophir*.

The greenish yellow of *Hyperion* (Mead) never appealed to me very much although it is popular with many people and is easy to grow and a free bloomer. I like the large and gaily colored *George Yeld* (Perry) and *Mikado* (Stout).

I also like the deep golden yellow of *Mrs. A. H. Austin* (Betscher). The color does not fade as readily as most deep yellows and it is a free bloomer.

Moonbeam (Sass) is a tall growing creamy yellow and as near white as any day lily I have seen, and is fine in every way.

REDS

Festival (Stout) The large open flowers are a combination of red, brown, and orange. The general effect is a very pleasing rosy red bicolor. The many flowers are carried on a forty-five inch unusually well branched

stem that does not require staking. It blooms freely over a very long period of time and is a grand daylily.

Massasoit (Nesmith) Grows five feet tall, the form and size of the flowers is similar to *Festival*. The color is reddish copper, nearly a self, is lustrous, showy and a strong grower, I like it very much.

Dawn Play (Nesmith) is a rosy red with a small golden heart. It is a large, well formed, sprightly flower, very fine.

Matador (Nesmith) A rich light mahogany, almost a light crimson red, a very attractive color. The sepals are a few shades lighter than the petals. It is a full cup shaped flower on a thirty-eight inch stem. *Matador* gives a much redder effect than *Festival* or *Massasoit* and is a fine addition to our reds.

Emperor Jones (Hayward) is a very dark blackish-maroon, striking in color. The flowers are of good size, open widely, and have a light stripe in mid-petal.

Wekiwa (Traub) is a well formed open flower of good size. The color is a dark red, a fine daylily.

Wolof (Stout) A good sized flower of dark maroon with an orange throat and a light yellow midrib. It has some brown overlay that dulls it a little, but it attracts a lot of attention.

Black Falcon (Nesmith) I have not seen *Black Falcon* growing but have seen Kodachrome pictures of it and have talked with competent judges of daylilies who proclaim this the largest and finest very dark daylily they have seen. The color is a dark maroon purple almost black, with a canary yellow center. It grows forty inches tall.

Leonian Seedlings. I saw about a dozen selected red seedlings of Dr. Leonian's this year, they covered quite a range of colors from dark red to nearly black. Some were quite attractive in color. All were one year plants, so I couldn't judge size, height or branching. Hybridizers are after a good bright cherry red self and if it hasn't already arrived it is about due.

Claar Seedlings. Mr. Elmer Claar of Illinois last summer bloomed an astonishing number of nice reds, most of them of medium size and height. A number of them were nice sprightly reds, his *No. 39-4* appeared to be the best of the lot.

Fulva Rosea is producing many good reds as well as near pinks. I have crossed it with a number of the Sass giant yellows and expected the first generation to be dull faded looking pinks, but was surprised to find some good large, rosy red flowers on the order of *Festival* and *Massasoit*.

PINK TONES

Fulva Rosea The ancestry of most, if not all pink toned daylilies, can be traced back to *Rosea*. It is a hardy, free blooming species, increases rapidly, sending out runners, a habit that is inherited by a few of its offspring. The flowers are a rosy pink, rather narrow petaled and long. The willowy stems are forty or more inches tall and quite well branched. It gives a bright color note in the garden.

Heather Rose (Nesmith) is a large open flower of good form and substance. The color, a soft or subdued pastel pink, fades rather quickly and



H. flava
See page 69.

Hemerocallis flava
Reduced Plate from forthcoming Stout monograph



See page 69.

Hemerocallis Middendorffii
Reduced Plate from forthcoming Stout monograph

should be planted in partial shade. These soft pastel pink shades are popular with many ladies, but do not appeal to me very strongly. I believe *Heather Rose*, which is my choice of all pink toned daylilies I have seen, and other similar pinks, are but forerunners of more sprightly, deeper, richer toned pinks, that will shortly appear in the gardens of many hybridizers.

Piquante (Nesmith) has some attractive soft pink or raspberry tones. The flowers are of medium size with wider petals than sepals and are well carried on forty inch stems. It is a good daylily in this color class.

Linda (Stout) is a nicely formed large full flower. The yellow petals are flecked with rose and cinnamon, giving the flower a pink tone that is very pleasing. It is a strong grower and a free bloomer. It is a very fine and popular daylily.

Claar Seedlings. Mr. Claar last summer had about a dozen nice pale pink toned seedlings on the order of *Heather Rose* and a number of very large, full petaled open flowers that are hard to classify as to color. They are between the pinks and the reds, and carry terra-cotta and henna shades. They are very attractive and appealed to me immensely. Mr. Claar has for several years been securing pollen from Mr. Hayward of Winter Park, Florida from large late-blooming daylilies and using it on early blooming varieties in Illinois, hoping to produce larger flowered early bloomers and in a greater variety of colors. Several seedlings that bloomed early last spring looked very encouraging. They will have to be observed for a few years to see if they continue to bloom in late May or early June in Northern Illinois. There is a possibility that they "just got" their blooming dates mixed last spring.

MEMORANDUM ON A MONOGRAPH OF THE GENUS *HEMEROCALLIS*

A. B. STOUT,
The New York Botanical Garden

A folio monograph devoted to the genus *Hemerocallis* is now in the late stages of preparation. As now planned this volume will consist of 24 colored plates 11 by 15 inches in size, about 25 pen sketches, and at least 90 pages of text.

The plates portray in true colors and in natural size or in one-half natural size the flowers (a) of the known species of *Hemerocallis*, (b) of certain species that are to be described as new, (c) of the best of the older horticultural clones, and (d) of the most important of the new types recently developed by hybridization and selective breeding. For most of the species there is an entire plate which shows the natural variations in the flowers, the character of the flower buds, the branching of the inflorescence, the capsules, and, in various cases, the roots. Photographs of three of the plates are herewith shown in Plates 206, 207 and 208. Pen sketches, all made to the same scale, show the habits of growth and the relative sizes of entire plants that are typical for the species and for the range of growth-habits in the horticultural clones. The text is a botanical



See page 69.

and horticultural discussion of the genus based on studies (a) of the literature, (b) of specimens in the most important herbaria of Europe and America, (c) of living plants in European Botanical Gardens, and (d) of the extensive collection of living plants assembled at The New York Botanical Garden.

The matter of the publication of this volume has been considered in a preliminary way. A well-bound folio of the character contemplated can be published at lowest cost by advance subscription. It now seems that the subscriptions of 300 sponsors at a cost of approximately \$60.00 each would ensure the printing of an edition of at least 500. If a larger edition could be printed and sold a profit would accrue which might constitute a revolving fund for the publication of other folios of similar character. On the basis just outlined the publisher would receive no profit except an "overhead" percentage for actual expenditures. It may be emphasized that patron subscribers would not, in the strict sense, be subsidizing the publication beyond the purchase cost of a volume which each would possess. Yet the advance subscriptions would make the publication possible and in recognition of this the list of patron subscribers could be printed in the edition.

EVALUATION OF DAYLILIES FOR NORTHERN FLORIDA

JOHN V. WATKINS,
Assistant Professor, Horticulture,
University of Florida

[*Editorial Note.*—This report by Prof. Watkins is a landmark since it is the first comprehensive regional evaluation of daylilies using the official scorecard, and indicating the ratings on a numerical basis. Similar evaluations are needed from other climatic regions. Such regional evaluations will serve as a fitting background for the evaluation of daylily clones on a continental basis by a committee of specialists. Prof. Watkins is congratulated on his pioneer work. —H. P. Traub.]

These evaluations are based on observations and data taken in the Daylily Display Garden of the University of Florida. While all of these ratings are solely the author's, they have been arrived at with a great deal of thought and deliberation and are greatly influenced by the reactions and remarks of fellow staff members and the many gardeners who visit the Display Garden annually. In arriving at the numerical values given the official score card for rating daylily clones on page 126, 1940 HERBERTIA, was used.

1. SPECIES

<i>Species:</i>	<i>Rating:</i>	<i>Species:</i>	<i>Rating:</i>
<i>Hemerocallis multiflora</i>	-----7.0	<i>Hemerocallis aurantiaca</i>	-----9.9
<i>Hemerocallis minor</i>	-----9.6	<i>Hemerocallis Forrestii</i>	-----7.7
<i>Hemerocallis flava</i>	-----7.0	<i>Hemerocallis nana</i>	-----7.0
<i>Hemerocallis citrina</i>	-----7.0	<i>Hemerocallis Dumortierii</i>	-----7.7
<i>Hemerocallis serotina</i>	-----9.6	<i>Hemerocallis Middendorffii</i>	----7.7

2. CLONES IN COMMERCE FOR MORE THAN THREE YEARS

<i>Clone:</i>	<i>Rating:</i>	<i>Clone:</i>	<i>Rating:</i>
<i>Ajax</i> -----	8.0	<i>Golden Dream</i> -----	8.6
<i>Alba striata</i> -----	7.9	<i>Golden Mantle</i> -----	8.8
<i>Amaryllis</i> -----	8.5	<i>Golden West</i> -----	9.0
<i>Apricot</i> -----	7.8	<i>Goldeni</i> -----	8.0
<i>Aurantiaca major</i> -----	9.9	<i>Gracilis</i> -----	8.0
<i>Aureole</i> -----	9.9	<i>Guisseppi, Cissy</i> -----	7.0
<i>Aurillo</i> -----	8.0	<i>Gypsy</i> -----	8.0
<i>Austin, Mrs. A. H.</i> -----	9.0	<i>Hankow</i> -----	8.0
<i>August Pioneer</i> -----	7.8	<i>Harvest Moon</i> -----	9.0
<i>Bardeley</i> -----	7.8	<i>Hippeastrum</i> -----	7.0
<i>Baroni</i> -----	7.4	<i>Hume, Emily</i> -----	9.9
<i>Bagdad</i> -----	9.7	<i>Hyperion</i> -----	9.9
<i>Bay State</i> -----	8.2	<i>Imperator</i> -----	8.0
<i>Betscher, Anna</i> -----	9.3	<i>Kwanso</i> -----	7.7
<i>Bijou</i> -----	9.3	<i>Kwanso Variegatus</i> -----	7.0
<i>Boutonnierre</i> -----	7.8	<i>Ladhams, B</i> -----	7.0
<i>Bowles, E. A.</i> -----	8.8	<i>Lady F. Hesketh</i> -----	7.0
<i>Brownie</i> -----	7.9	<i>Lemon Queen</i> -----	7.0
<i>Burbank</i> -----	7.0	<i>Lemona</i> -----	7.0
<i>Burmah</i> -----	7.0	<i>Linda</i> -----	9.6
<i>Byng of Vimy</i> -----	8.0	<i>Lovett's Lemon</i> -----	8.0
<i>Calypso</i> -----	7.9	<i>Lovett's Orange</i> -----	8.0
<i>Chengtu</i> -----	8.0	<i>Luteola major</i> -----	8.0
<i>Chisca</i> -----	9.8	<i>Luteola palens</i> -----	8.0
<i>Chrome Orange</i> -----	8.8	<i>Mandarin</i> -----	7.0
<i>Cinnabar</i> -----	9.1	<i>Mann, Mrs. J. R.</i> -----	8.0
<i>Citronella</i> -----	7.0	<i>Marcus</i> -----	7.8
<i>Crawford, J. A.</i> -----	8.0	<i>May Morn</i> -----	8.8
<i>Cressida</i> -----	8.9	<i>Midas</i> -----	7.0
<i>Curlypate</i> -----	7.7	<i>Mikado</i> -----	9.9
<i>Dauntless</i> -----	9.9	<i>Miranda</i> -----	8.8
<i>Dawn</i> -----	7.0	<i>Modesty</i> -----	7.9
<i>Dazzler</i> -----	7.0	<i>Moonstone</i> -----	7.0
<i>Domestico</i> -----	9.9	<i>Mulleri</i> -----	7.0
<i>Dwarf Yellow</i> -----	7.9	<i>Nocerensis</i> -----	7.0
<i>Eldorado</i> -----	8.0	<i>Ochroleuca</i> -----	7.0
<i>Estmere</i> -----	8.0	<i>Ophir</i> -----	9.1
<i>Europa</i> -----	9.8	<i>Orangeman</i> -----	7.8
<i>Festival</i> -----	8.0	<i>Pale Moon</i> -----	8.9
<i>Flavinia</i> -----	7.0	<i>Parthenope</i> -----	8.9
<i>Florham</i> -----	9.0	<i>Patricia</i> -----	9.9
<i>Fulva Cypriana</i> -----	8.9	<i>Perry, Gladys</i> -----	7.0
<i>Fulva Maculata</i> -----	8.9	<i>Perry, Margaret</i> -----	8.8
<i>Fulva, wild type</i> -----	7.0	<i>Perry, Mrs.</i> -----	8.8
<i>Floriana</i> -----	7.8	<i>Perry, Thelma</i> -----	7.0
<i>Gold Dust</i> -----	7.8	<i>Queen of May</i> -----	8.0
<i>Gold Imperial</i> -----	7.8	<i>Radiant</i> -----	8.8
<i>Golden Bell</i> -----	9.7	<i>Rajah</i> -----	8.7

Clone:	Rating:	Clone:	Rating:
Regel, Dr. -----	8.0	Taplow Yellow -----	9.9
Rosalind -----	8.0	The Gem -----	9.0
Royal -----	8.8	Theron -----	8.1
Salem -----	7.0	Vesta -----	8.5
Seith, Mrs. -----	8.0	Vulcan -----	9.1
Semperflorens -----	9.9	Virginica -----	7.7
Serenade -----	9.0	Wau-Bun -----	9.9
Sir Michael Foster -----	9.0	Winsome -----	8.0
Sirius -----	9.0	Wolof -----	9.5
Sonny -----	8.7	Woodlot Gold -----	8.0
Soudan -----	8.9	Wyman, D. D. -----	8.0
Sovereign -----	7.8	Wyman, Mrs. W. H. -----	8.0
Sungold -----	7.8	Yeld, George -----	8.5
Sunkist -----	7.8	Yellow Hammer -----	8.0
Sunny West -----	9.0	Zara -----	7.8
Tangerine -----	8.0		

SUMMARY OF CLONES IN COMMERCE FOR MORE THAN THREE YEARS

Numerical ratings:		Number of clones:	Percentage:
9.6-100	Excellent -----	16 -----	12.6
9.1-9.5	Very Good -----	6 -----	4.7
8.6-9.0	Good -----	27 -----	21.3
8.1-8.5	Fair -----	5 -----	3.9
7.6-8.0	Marginal -----	49 -----	38.6
Below 7.6	Discard -----	24 -----	18.9
Total -----		127 -----	100.0

3. CLONES IN COMMERCE FOR LESS THAN THREE YEARS

Clone:	Rating:	Clone:	Rating:
Araby (Hayward) -----	9.1	Osceola II (Hayward) -----	9.0
Cleo (Hayward) -----	8.8	Senator Andrews (Hayward) --	9.1
Florida (Hayward) -----	8.0	Star of Gold (Sass) -----	9.1
Kanapaha (Watkins) -----	9.6	Swan (Watkins) -----	9.7
Marcelle (Hayward) -----	9.1	Sybil (Hayward) -----	9.0
Marconi (Hayward) -----	8.1	The Yearling (Hayward) -----	8.7
Mrs. John J. Tigert (Watkins)	9.1	William Pelham (Hayward) ---	8.0

SUMMARY OF CLONES IN COMMERCE FOR LESS THAN THREE YEARS

Numerical ratings:		Number of clones:	Percentage:
9.6-100	Excellent -----	2 -----	14.3
9.1-9.5	Very Good -----	5 -----	35.7
8.6-9.0	Good -----	4 -----	28.6
8.1-8.5	Fair -----	1 -----	7.1
7.6-8.0	Marginal -----	2 -----	14.3
Below 7.6	Discard -----	0 -----	0.0
Total -----		14 -----	100.0

EVALUATION OF DAYLILIES FOR CENTRAL FLORIDA

HAMILTON P. TRAUB and WYNDHAM HAYWARD

The ratings given below are based on several years' observation of daylily species and hybrid clones in Central Florida. Following the example set by Prof. Watkins of the University of Florida in the preceding article, the official score card was used in arriving at the ratings and the results are expressed on a numerical basis.

1. SPECIES AND VARIETIES

<i>Hemerocallis multiflora</i>	8.6	<i>Hemerocallis aurantiaca</i>	9.0
<i>Hemerocallis flava</i>	7.5	<i>Hemerocallis aurantiaca</i> var.	
<i>Hemerocallis flava</i> var. <i>major</i> ..	8.8	<i>major</i>	9.2
<i>Hemerocallis serotina</i>		<i>Hemerocallis exaltata</i>	6.0
(= <i>Thunbergii</i>)	8.5	<i>Hemerocallis Forrestii</i> ..	8.8
<i>Hemerocallis citrina</i>	7.5	<i>Hemerocallis plicata</i> (not tested)	
<i>Hemerocallis minor</i>	8.5	<i>Hemerocallis nana</i> ----	7.5
<i>Hemerocallis fulva</i> (See <i>Fulva</i>		<i>Hemerocallis Dumortierii</i> ..	7.5
<i>Europa</i> , <i>Fulva Maculata</i> ,		<i>Hemerocallis Middendorffii</i> ..	7.5
<i>Fulva Rosalind</i> , etc.)			

2. HYBRID CLONES

Clone	Rating	Clone	Rating
<i>Ajax</i>	8.6	<i>Calypso</i>	7.5
<i>Alba Striata</i>	8.0	<i>Cecil Houdyshel</i>	8.7
<i>Algeria</i>	8.6	<i>Charlotte Traub</i>	8.6
<i>Aloma</i>	8.0	<i>Chisca</i>	8.7
<i>Amarillo</i>	8.5	<i>Chrome Orange</i>	8.9
<i>Amaryllis</i>	8.0	<i>Cinnabar</i>	8.8
<i>Anna Betscher</i>	8.5	<i>Circe</i>	8.6
<i>Antares</i>	8.8	<i>Cissy Giuseppe</i>	7.0
<i>Antoinette</i>	9.0	<i>Cleo</i>	9.0
<i>Apricot</i>	8.0	<i>Corinne Robinson</i>	9.3
<i>Araby</i>	9.6	<i>Cressida-Gypsy</i>	9.2
<i>Audrey Blaser</i>	8.7	<i>Crown Prince</i>	8.0
<i>Aureole</i>	8.6	<i>Curlypate</i>	7.0
<i>Bagdad</i>	9.0	<i>Dazzler</i>	7.5
<i>Bardeley</i>	8.0	<i>Dawn</i>	8.0
<i>Bay State</i>	8.5	<i>Dauntless</i>	9.5
<i>Betty</i>	8.8	<i>Delovely</i>	8.0
<i>Bijou</i>	8.6	<i>Domestico</i>	8.0
<i>Boutonniere</i>	9.0	<i>Dorthy McDade</i>	9.0
<i>Brownie</i>	7.5	<i>Dr. Hughes</i>	9.6
<i>Burbank</i>	7.5	<i>Dr. Stout</i>	9.8
<i>Burgundy</i>	8.0	<i>Duchess of Windsor</i>	9.8
<i>Burmah</i>	8.0	<i>E. A. Bowles</i>	9.0
<i>Carmen</i>	8.0	<i>Elaine</i>	9.6
<i>Carnival</i>	8.6	<i>Elizabeth Pike</i>	8.6

Clone	Rating
<i>Emberglow</i> -----	9.7
<i>Emily Hume</i> -----	8.0
<i>Emperor Jones</i> -----	9.8
<i>Estelle Friend</i> -----	8.6
<i>Estmere</i> -----	8.0
<i>E. W. Yandre</i> -----	9.0
<i>Festival</i> -----	7.5
<i>Fire Red</i> -----	9.0
<i>Flamante</i> -----	8.5
<i>Flamid</i> -----	8.0
<i>Florida</i> -----	9.0
<i>Fred Howard</i> -----	9.5
<i>Fulva Chengtu</i> -----	8.5
<i>Fulva Cypriana</i> -----	8.0
<i>Fulva Europa</i> -----	8.8
<i>Fulva Kwanso</i> -----	8.8
<i>Fulva Maculata</i> -----	9.0
<i>Fulva Rosalind</i> -----	9.0
<i>George Kelso</i> -----	9.6
<i>George Yeld</i> -----	8.0
<i>Ginger</i> -----	9.0
<i>Gloriosa</i> -----	7.6
<i>Golden Dream</i> -----	7.5
<i>Golden Glow</i> -----	9.2
<i>Goldeni</i> -----	7.5
<i>Golden West</i> -----	9.5
<i>Gold Dust</i> -----	8.5
<i>Granada</i> -----	9.0
<i>Happiness</i> -----	8.7
<i>Harvest Moon</i> -----	8.8
<i>Hector</i> -----	9.0
<i>Hesperus</i> -----	9.0
<i>Helen Wheeler</i> -----	9.4
<i>Hyperion</i> -----	8.8
<i>Imperator</i> -----	9.0
<i>Indian Chief</i> -----	9.6
<i>Irene</i> -----	8.8
<i>Iris Perry</i> -----	9.0
<i>J. A. Crawford</i> -----	9.0
<i>John Blaser</i> -----	8.8
<i>J. S. Gaynor</i> -----	9.2
<i>June Boissier</i> -----	8.5
<i>Lady Fermor Hesketh</i> -----	8.9
<i>La Tulipe</i> -----	9.6
<i>Lemona</i> -----	8.5
<i>Lena Hughes</i> -----	8.6
<i>Linda</i> -----	9.0
<i>Louise</i> -----	8.6

Clone	Rating
<i>Mandarin</i> -----	8.8
<i>Majestic</i> -----	8.8
<i>Mary Florence</i> -----	8.8
<i>Marconi</i> -----	8.8
<i>Margaret Perry</i> -----	8.7
<i>Marcus</i> -----	8.6
<i>Mauve Rose</i> -----	7.5
<i>Mayor Starzynski</i> -----	9.6
<i>Mary Sadler</i> -----	9.0
<i>Midas</i> -----	0.0
<i>Mikado</i> -----	9.4
<i>Mildred Orpet</i> -----	9.8
<i>Minnie</i> -----	9.0
<i>Miranda</i> -----	9.0
<i>Modesty</i> -----	8.5
<i>Mrs. A. H. Austin</i> -----	8.0
<i>Mrs. H. H. Dewey</i> -----	8.8
<i>Mrs. John T. Tigert</i> -----	9.0
<i>Mrs. W. H. Wyman</i> -----	7.5
<i>Mrs. Perry</i> -----	8.7
<i>Multiflora Luna</i> -----	7.5
<i>Nubiana</i> -----	9.0
<i>Ophir</i> -----	8.9
<i>Old Rose (Hayward)</i> -----	8.8
<i>Othello</i> -----	8.8
<i>Osceloa II</i> -----	9.0
<i>Pale Moon</i> -----	8.6
<i>Parthenope</i> -----	8.0
<i>Patricia</i> -----	9.9
<i>Peony Red</i> -----	9.6
<i>Princess</i> -----	9.4
<i>Queen Mary</i> -----	8.8
<i>Queen of May</i> -----	8.7
<i>Queen Wilhelmina</i> -----	8.9
<i>Radiant</i> -----	9.0
<i>Rajah</i> -----	9.0
<i>Ralph Wheeler</i> -----	9.0
<i>Reba Cooper</i> -----	8.9
<i>Reggie Perry</i> -----	8.5
<i>Rose Queen</i> -----	8.8
<i>Rosita</i> -----	8.8
<i>Royal</i> -----	8.7
<i>Rouge Vermilion</i> -----	9.1
<i>Ruby Supreme</i> -----	9.8
<i>Russell Wolfe</i> -----	8.7
<i>San Juan</i> -----	9.8
<i>Semperflorens</i> -----	7.8
<i>Senator Andrews</i> -----	8.5

Clone	Rating	Clone	Rating
<i>Serenade</i>	8.5	<i>Theodore Mead</i>	9.6
<i>Shirley</i>	8.8	<i>Theron</i>	9.0
<i>Sibyl</i>	8.8	<i>Vesta</i>	8.8
<i>Sirius</i>	7.4	<i>Victory Montevideo</i>	8.7
<i>Sir Michael Foster</i>	8.8	<i>Victory Suomussalmi</i>	9.1
<i>Sonny</i>	9.8	<i>Victory Taierhchwang</i>	9.2
<i>Soudan</i>	9.6	<i>Viscountess Byng</i>	8.0
<i>St. Joan</i>	9.0	<i>Vulcan</i>	9.0
<i>Sungold</i>	7.5	<i>Wau-bun</i>	9.6
<i>Sunny West</i>	8.5	<i>Wekiwa</i>	9.5
<i>Sunset</i>	8.5	<i>Winsome</i>	8.0
<i>Sylphide</i>	8.7	<i>Woodlot Gold</i>	8.0
<i>Tangerine</i>	8.0	<i>Wolof</i>	9.0
<i>Thelma Perry</i>	8.7	<i>Yellow Hammer</i>	8.6
<i>The Gem</i>	8.6	<i>Zara</i>	8.0

SUMMARY

		Number in each class :	Per cent in each class :
9.6 to 100	Excellent	18	10.2
9.1 to 9.5	Very Good	17	9.7
8.6 to 9.0	Good	86	48.9
8.1 to 8.5	Fair	14	7.9
7.6 to 8.0	Marginal	26	14.8
Below 7.6	Discard	15	8.5
	Total	176	100.0

It is of interest to note that approximately 10 per cent of the clones, as grown under central Florida conditions and on the basis of the present ratings, are *Excellent* (9.6 to 100) ; another 10 per cent are *Very Good* (9.1 to 9.5) ; almost 49 per cent are *Good* (8.6 to 9.0) ; about 8 per cent are *Fair* (8.1 to 8.5) ; and about 23 per cent (*Marginal* and *Discard* classes) might be considered for eventual discard (Below 8.1). Even then there would be 135 clones still in the running.

Considering the great number of named daylily clones that are introduced annually at present, it will be necessary to make a rigid selection if one wants to retain the best 100 clones.

DAYLILY MUSINGS AND 1941 EXPERIMENTAL POLL

ELMER A. CLAAR, *Illinois*

Interest in daylilies is growing.

The American Iris Society held its convention at Nashville, Tennessee, on May 9th and 10th, 1941. Mrs. Claar and I drove down and had a swell time. These Iris fans are really folks. I am a Kodachrome moving picture fan. I had taken pictures of daylilies in the East, South, and

Middle West the year before and Mrs. Nesmith wrote and asked me if I would bring my pictures of Fairmount Gardens at daylily time and show them to her at Nashville. I was very happy to do this at Nashville. Mr. and Mrs. Nesmith asked if they might invite a few friends, to which I replied, "The more the merrier." Well, before we were through we actually had to hire a hall to take care of the crowd. Nearly 25 per cent of those registered at the convention came to see the pictures. Another 25 per cent voiced a regret that they had not known that I was going to show daylily pictures, otherwise they could have seen the new introductions.

Next year at the Iris meeting I shall attempt to see that everyone knows when I am going to show my daylily pictures and also that everyone is invited.

Daylilies are slow in propagation and are not widely disseminated at the present time. I believe the hybridizers could increase interest if they would introduce the rare colorings by classes. I still believe there is an excessive number of yellows and oranges and a need for evaluating daylilies according to their purpose.

1941 EXPERIMENTAL DAYLILY POLL

In the 1939 Kelso poll 40 people voted. In 1940 I sent questionnaires to 67 people and in 1941 I sent questionnaires to 55 people. Again I was disappointed in not receiving votes from the people who are best informed about daylilies.

Inasmuch as a daylily does not give a normal performance and will not be widely distributed or typical until it has grown in one spot for more than three years, only those introduced in commerce over three years and catalogued by a commercial firm during 1937 or earlier are included. These are the only plants in my opinion worth the votes of the Society.

The poll as now taken is based upon the date of first bloom of the flower in the north, and from this point of view the classification is subdivided into four classes—Early, Intermediate, Summer, and Fall bloomers.

The next classification has to do with the color of the flower. I have divided the flowers into four color classes—monochromes or one color, two-color, three-color, and four or more colors. Much of the work done on this poll up to this time has been done on monochromes, inasmuch as there are entirely too many orange and yellow daylilies that have been introduced. In the matter of two, three, and four-colored daylilies it is most difficult to arrive at a satisfactory sub-classification. Dr. Stout has recently written an article entitled "Color Patterns in Daylilies." At first reading this strikes me as making the subject quite complicated because under bi-colors there would be at least ten different patterns and obviously this would be true of the three and four-colored flowers. It may be that the subject doesn't admit of being put in any more simple manner, but too great a subdivision of the subject matter means it just won't be accepted by the general public. The colors that we have used in a general way are those used by the Massachusetts Horticultural Society.

The ten best daylilies this year became twelve because of a tie in the last three—*Sonny*, *Soudan*, and *Wolof*. Two newcomers this year are Dr. Stout's *Linda* and *Wolof*.

Table 1. A rating of the Daylilies in commerce over three years using the numerical system, that is, “A” is 95, “B” is 85, “C” is 75 and “D” is discard. This is the same plan used by the late Prof. Kelso, but we have limited it to plants in commerce over three years and we listed only those that received five votes or more. We took the average score by adding all the votes on a variety and dividing this number by the number of votes received by the flower.

EARLY BLOOMERS					
YELLOW					
LIGHT & GREEN YELLOW					
		No. of votes	“A”	“B”	“C”
<i>Florham</i>	89.29	7	5	—	2
<i>Flava</i>	89.00	5	2	3	
<i>Gracilis</i>	87.00	5	3	—	2
YELLOW					
<i>Gold Dust</i>	86.43	7	3	2	2
<i>Estmere</i>	85.00	8	2	4	2
ORANGE YELLOW					
<i>Aureole</i>	87.50	8	3	4	1
<i>Apricot</i>	86.25	8	2	5	1
ORANGE					
ORANGE					
<i>Tangerine</i>	85.00	6	2	2	2
INTERMEDIATE BLOOMERS					
YELLOW					
YELLOW					
<i>Wau-Bun</i>	92.00	10	8	1	1
<i>Modesty</i>	90.56	9	5	4	
<i>Winsome</i>	90.00	10	6	3	1
<i>Sir Michael Foster</i>	89.29	7	4	2	1
ORANGE YELLOW					
<i>Queen Mary</i>	91.00	5	3	2	
<i>Queen of May</i>	83.57	7	2	2	3
ORANGE					
ORANGE					
<i>Dover</i>	83.00	5	1	2	2
SUMMER BLOOMERS					
YELLOW					
LIGHT & GREEN YELLOW					
<i>Patricia</i>	91.47	17	12	4	1
<i>Hyperion</i>	88.50	20	9	9	2
<i>Sonny</i>	81.25	8	1	3	4

		No. of votes “A” “B” “C”			
YELLOW					
Golden Bell	86.11	9	4	2	3
Anna Betscher	86.00	10	3	5	2
Circe	85.00	7	1	5	1
ORANGE YELLOW					
Golden West	88.75	8	5	1	2
The Gem	88.33	6	2	4	
Bay State	86.25	8	3	3	2
Ophir	85.63	16	4	9	3
ORANGE					
YELLOW ORANGE					
Semperflorens	89.29	7	4	2	1
Chrome Orange	88.75	8	4	3	1
Radiant	86.25	8	3	3	2
Harvest Moon	85.00	6	2	2	2
ORANGE					
Cressida	89.00	5	3	1	1
Mrs. A. H. Austin	86.11	9	4	2	3
Aurantiaca Major	85.00	7	2	3	2
Goldeni	85.00	6	2	2	2
Midas	81.00	5	—	3	2
RED ORANGE					
Imperator	89.29	7	4	2	1
Gypsy	87.86	7	4	1	2
REDS					
ORANGE RED					
Kwanso Plena	87.00	5	3		2
RED					
Vulcan	89.17	12	6	5	1
ROSE					
Rosalind	87.86	14	6	6	2
POLYCHROME & SHOTS					
Dauntless	93.57	7	6	1	
Chengtu	90.00	6	3	3	
Fulva Maculata	88.33	9	3	6	
Bijou	87.00	5	2	2	1
Cinnabar	87.00	5	2	2	1
Bagdad	85.00	5	1	3	1
George Yeld	83.00	5	1	2	2
Serenade	83.00	5	1	2	2

BI-COLORS

PETAL ONE COLOR, SEPAL ANOTHER:

		No. of votes "A" "B" "C"			
<i>Festival</i>	86.11	9	3	4	2
<i>Boutonniere</i>	85.00	5	2	1	2

FLOWER ONE COLOR, SPOT ON THROAT ANOTHER:

<i>Mikado</i>	90.26	19	11	7	1
<i>Rajah</i>	87.94	17	6	10	1

Table 2. We also secure a vote on the 1st, 2nd and 3rd best in each blooming period and in each color class for plants in commerce over three years. We eliminated all plants that did not receive one first class vote.

EARLY BLOOMERS				ORANGE YELLOW			
YELLOW					1st	2nd	3rd
GREEN YELLOW				<i>Queen Mary</i>	3	2	—
	1st	2nd	3rd	<i>Queen of May</i>	2	2	3
<i>Florham</i>	5	—	2	<i>Crown of Gold</i>	1	1	
<i>Gracilis</i>	3	—	2				
<i>Flava</i>	2	3	—	ORANGE			
<i>Flavina</i>	2	—	1	YELLOW ORANGE			
<i>Salem</i>	1	—	—	<i>Omphale</i>	1	—	—
YELLOW				ORANGE			
<i>Earlianna</i>	4	—	—	<i>Zara</i>	2	—	—
<i>Gold Dust</i>	3	2	2	<i>Dover</i>	1	2	2
<i>Estmere</i>	2	4	2	<i>Glorianna</i>	1	1	—
<i>Sovereign</i>	1	1	1	<i>Goldeni</i>	1	—	—
<i>Domestico</i>	1	—	—	<i>Sungold</i>	1	—	—
<i>Dumortieri</i>	1	—	—	<i>Taplow Orange</i>	1	—	—
<i>Sieboldi</i>	1	—	—				
ORANGE YELLOW				SUMMER BLOOMERS			
<i>Aureole</i>	3	4	1	YELLOW			
<i>Apricot</i>	2	5	1	LIGHT AND GREEN YELLOW			
<i>Judge Orr</i>	2	—	—	<i>Patricia</i>	9	4	1
<i>Orangeman</i>	1	2	1	<i>Hyperion</i>	7	7	2
ORANGE				<i>Sonny</i>	1	1	4
ORANGE				<i>Starlight</i>	1	—	—
<i>Tangerine</i>	2	2	2	YELLOW			
<i>Middendorffii</i>	2	1		<i>Golden Bell</i>	5	1	2
INTERMEDIATE BLOOMERS				<i>Anna Betscher</i>	2	4	2
YELLOW				<i>Soudan</i>	2	2	—
YELLOW				<i>Circe</i>	1	3	1
<i>Wau-Bun</i>	8	1	1	<i>J. A. Crawford</i>	1	1	1
<i>Winsome</i>	6	3	1	<i>Gold Imperial</i>	1	1	—
<i>Modesty</i>	5	4	—	<i>Highboy</i>	1	—	—
<i>Sir Michael Foster</i>	4	2	1	<i>Woodlot Gold</i>	1	—	—
<i>Gaiety</i>	1	—	—				

ORANGE YELLOW

	1st	2nd	3rd
<i>Ophir</i>	6	6	3
<i>Golden West</i>	6	1	2
<i>Emily Hume</i>	3	—	3
<i>The Gem</i>	1	2	—
<i>Bay State</i>	1	1	—
<i>Mrs. Perry</i>	1	—	1

ORANGE

YELLOW ORANGE

<i>Chrome Orange</i>	4	2	1
<i>Semperflorens</i>	4	1	1
<i>Radiant</i>	2	3	2
<i>Harvest Moon</i>	2	1	2
<i>Irene</i>	1	—	—

ORANGE

<i>Mrs. A. H. Austin</i>	4	1	3
<i>Cressida</i>	2	1	1
<i>Golden Dream</i>	2	1	1
<i>Crown of Gold</i>	2	1	—
<i>Majestic</i>	1	2	—
<i>Winnie Nightingale</i>	1	—	1
<i>Reba Cooper</i>	1	—	—
<i>Vesta</i>	1	—	—

RED ORANGE

<i>Imperator</i>	4	2	1
<i>Gypsy</i>	4	1	1
<i>Europa</i>	3	1	—

RED

ORANGE RED

<i>Kwanso Plena</i>	2	—	1
<i>Margaret Perry</i>	1	—	1
<i>Cissie Guiseppi</i>	1	—	—
<i>Sir William</i>	1	—	—

RED

<i>Vulcan</i>	6	3	—
<i>Wolof</i>	2	—	—
<i>Theron</i>	1	—	1
<i>Redahd</i>	1	—	—

ROSE

	1st	2nd	3rd
<i>Fulva Rosea</i> <i>(Rosalind)</i>	5	5	2
<i>Heather Rose</i>	1	—	1
<i>Fulva Rosea</i> <i>(Chinese)</i>	1	—	—
PINK			
<i>Dawn Play</i>	1	—	—
<i>Pink Lustre</i>	1	—	—

PURPLE

<i>Emperor Jones</i>	2	1	—
<i>Burgundy</i>	1	—	—

BROWN

<i>Maya</i>	1	—	—
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NEAR WHITE

<i>Hesperus</i>	3	—	—
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POLYCHROMES AND SHOTS

<i>Dauntless</i>	4	—	1
<i>Fulva Maculata</i>	2	3	—
<i>Araby</i>	2	1	—
<i>Chengtu</i>	2	1	—
<i>Bagdad</i>	2	—	1
<i>Byng of Vimy</i>	2	—	—
<i>Linda</i>	2	—	—
<i>Bijou</i>	1	1	—
<i>Serenade</i>	1	—	2
<i>Cinnabar</i>	1	—	—
<i>Cressida</i>	1	—	—
<i>Dawn</i>	1	—	—
<i>George Yeld</i>	1	—	—
<i>Sunkist</i>	1	—	—

BI-COLORS

PETAL ONE COLOR, SEPAL
ANOTHER COLOR

<i>Chicea</i>	4	—	—
<i>Festival</i>	2	2	2
<i>Boutonniere</i>	1	—	1

FLOWER ONE COLOR, SPOT
ON THROAT ANOTHER
COLOR

<i>Mikado</i>	8	4	1
<i>Rajah</i>	6	7	1

Table 3. There were 23 lists returned. It is interesting to note that 85 clones were listed by these 23 people. The last three clones were on four lists so that the "Ten Best" Daylilies in 1941 becomes Twelve.

<i>Mikado</i>	was on 13 lists	<i>Rosalind</i>	was on 9 lists
<i>Hyperion</i>	was on 12 lists	<i>Waubun</i>	was on 9 lists
<i>Patricia</i>	was on 12 lists	<i>Linda</i>	was on 5 lists
<i>Dauntless</i>	was on 11 lists	<i>Sonny</i>	was on 4 lists
<i>Rajah</i>	was on 10 lists	<i>Soudan</i>	was on 4 lists
<i>Ophir</i>	was on 10 lists	<i>Wolof</i>	was on 4 lists

THE SEED CHARACTER OF AMARYLLIS PROCERA

HAMILTON P. TRAUB, *Maryland*

During 1940, *Amaryllis procera* flowered in Florida for Mr. E. J. Anderson of Palm Beach, and this event was reported in *Herbertia* 1940. In January 1941 Mr. Anderson sent fresh seeds that had set in the spring of 1940. This indicates that the time required for seeds to mature is relatively long for this species, a fact that has been previously reported by Worsley (*Gard. Chron. Lond.* May 1929, pp. 377-379, figs. 188 and 189; *Herbertia* 6:118-119.1939). The illustration, Fig. 64, represents the seed character of this species as drawn from nature by the eminent artist and horticulturist, J. Marion Shull. It shows the character of the large D-shaped seeds, 17 mm. long by 10 mm. wide; jet black in color. The inner edge is about $\frac{1}{2}$ mm. thick, and the outer edge 1 mm. thick, somewhat sunken and wrinkled between the margins of the side walls. The embryo is about $1\frac{1}{2}$ mm. by 6 mm. and is embedded in horny endosperm.

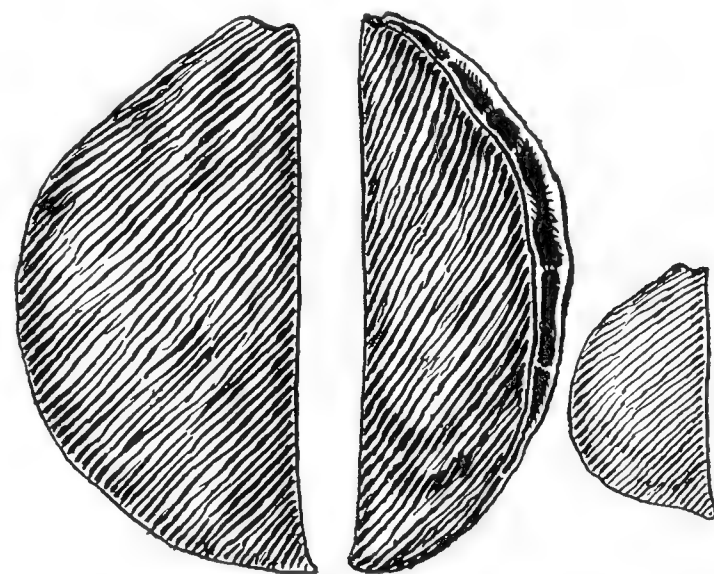


Fig. 64. Seed of *Amaryllis procera*: X2. Small Seed, XI. Drawn by J. Marion Shull.

WAYMAN DAYLILIES

After the rest of the material in this issue was already in print, descriptions of the following named daylily clones were received from Robert Wayman, Bayside, N. Y.—*Apache*, *Bordeaux*, *Brilliant*, *Brown Beauty*, *Brown Symphony*, *Carmine Champion*, *Carmine Gem*, *Duchess*, *Exquisite*, *Extravaganza*, *Fireworks*, *Forest Fire*, *Glamour*, *Grenadine*, *Jack Rose*, *Pink Beauty*, *Pink Champion*, *Pomegranate Beauty*, *Rapture*, *Red Beauty*, *Red Brilliance*, *Red Empress*, *Red Flare*, *Red Glory*, *Red King*, *Red Lustre*, *Red Raider*, *Red Satin*, *Redskin*, *Red Sox*, *Red Splendour*, *Red Wing*, *Rose Beauty*, *Rose Champion*, *Ruby Queen*, *Scarlet Beauty*, *Terra Cotta*, *Unique*, *Wildfire*, *Zulu*.

Since no advance notice was given by the editor, descriptions of these clones will be included in 1942 *HERBERTIA*, but this does not invalidate the rule that from now on not more than 15 new clones by any one breeder may be described in any one issue of *HERBERTIA* (See page 83.).—Ed.

REGISTRATION OF NEW CLONES

Descriptions of new clones of hybrid amaryllids for this section should reach the editor by June 1 if possible. Information sent after that date may be held over to the next issue if space is not available. This information is published to avoid duplication of names, and to provide a place for the authentic recording of *brief* descriptions. Names should be as short as possible—*one word is sufficient*. It is suggested that in no case should more than two words be used.

HYBRID DAYLILY (HEMEROCALLIS) CLONES

Trial Gardens. Cooperative daylily trial gardens have been established at (1) Cornell University, Dept. of Floriculture, Ithaca, N. Y.; (2) Southwestern Louisiana Institute, Dept. of Horticulture, Lafayette, La., and (3) Whitnall Park Arboretum, Milwaukee City and County Park Board, Milwaukee, Wisc.

Introducers should send complete collections of clones to these co-operating agencies in order that they may be impartially evaluated.

Limitation of clones described. On account of space limitations, not more than 15 clones from any one introducer will be published in this department in any one year. Breeders should use proper restraint in naming clones so that the work of evaluation will be simplified since inferior clones are bound to be weeded out sooner or later.

Introduced by Glen Saint Mary Nurseries Company, Glen St. Mary, Fla.; originated by John V. Watkins:

Kanapaha. Foliage upright, sharp-pointed, to about 18 inches, deciduous. Scapes heavy, robust, each one usually producing two proliferations in well established clumps. The blossoms, bright Cardinal Red in color, (M&P 5-L-5)¹ are sprightly and appeal universally to those who have seen the seedling in flower. As the segments are imbricated for 11½ inches above the perianth tube, the flower is not particularly full and wide-spreading. None of the available commercial varieties observed to date exhibit a color that is close to the sparkling Cardinal Red of this selection. Introduced in 1941. (See Plate 209.)

Swan. Foliage evergreen, upright, reaching a height of about 19 inches. The robust scapes, erect to about 27 inches, are furnished with white-margined bracts at their point of branching. Proliferations are not formed by this clone. The flowers, appearing in late May, are larger than those borne by any daylily in the collection at the University of Florida. The perianth segments, broadly arched, informally recurved, not inbricated, are of a glowing color near to Cavalry yellow, (M&P 9-L-7). This seedling, selected in 1935, for the large size and distinctive form of its blossoms, has been much admired by garden visitors, and will be introduced during the spring of 1942. (See Plate 209.)

¹ This and similar references refer to Maerz & Paul, **A Dictionary of Color**.



See page 83.

Daylily clones: Swan (upper) and Kanapaha (lower)

Introduced by J. B. S. Norton, Hyattsville, Md.; year of introduction is indicated after each name:

Betty (1938); growth vigorous, propagation rapid, scape graceful, 2-3 feet high, flowering through most of May, flowers clustered, yellow, fragrant, 2-3 inches wide, night and day blooming, 2 sets of flowers open at 6 p. m. Among the tallest of the first early.

Citronetta (1940); good foliage, slender 3-4 foot scape, rapid propagation, fragrant, light lemon, three inch flowers, June-July.

Damozel (1943); two foot scapes, 4 inch flower wide open, day blooming, July, segments narrow. The purest pink yet seen, no tint of yellow showing on the upper side.

Dorothy Dawn (1941); propagation slow, scapes 4 feet, flowers 5 inches wide, 6 inches long, shrimp pink to orange pink, open all day, July. The large creamy pink flower is more pleasing than most of the brighter pinks.

Elizabeth (1941); vigorous growth, rapid multiplication, graceful foliage, scapes 2-3 feet high, not branched, 3 inch star formed flowers with obtuse segments, day and night blooming, fragrant, chryse yellow, early May. The best of the early bloomers.

Frances (1942); scapes over 2 feet high, flower 3-4 inches wide, with wide obtuse segments, irregularly blended with orange brown and buff, June blooming. Unusual and rich coloring in a well formed flower.

Garden Lady (1942); short rhizomes, scapes 3 feet, flowers 5-6 inches wide, fully open, unusually wide throat, wide segments, salmon with lighter edges, July. Rare color and wide throat.

Gertrude (1941); scapes 3-4 feet, flowers 3-4 inches, orange with a slightly darker halo on the petals, June-July.

Glowing (1937); scapes 3 feet, abundant flowers over 3 inches wide, segments about an inch wide, light cadmium to light orange, petals with a narrow mar yellow spot giving a metallic sheen to the flower as a whole, June-July. The abundant flowers of this bright color make this variety very good for garden masses.

Orange Rex (1941); scapes 5-6 feet high with many 3-4 inch orange flowers. This kind towers over nearly all others.

Prince William (1940); scapes 2 feet, flowers 3 inches wide, with wide blunt segments, dull orange scarlet, June. One of the nearest pure red and has a well formed flower.

Redahd (1942); growth vigorous, scapes 3-4 feet high, not much branched but with very many buds, flowers 5-6 inches wide, dull purplish red with a light yellow mid line, June-July.

Takoma (1939); foliage graceful, the strong scapes 4-5 feet high, short branched along the upper part so that more than one flower at different levels may be in bloom at once, day blooming, flowers 5-6 inches wide, sepals dull orange, petals dark brown with a yellow mid line, July. This is the best bicolor I have seen.

Woodridge (1938); rapid propagating, graceful scape to 3 feet, the flowers open before sunset and close about 26 hours later so that in the evening two sets of flowers are open at once, sepals yellow, petals

dark red brown at first to light chocolate in the afternoon, long pointed and with a slight spiral twist, an inch wide, June and July. Very graceful and long keeping bicolor.

Last Night (1940); scapes 4 feet high, 4 inch very light yellow fragrant night blooming flowers in July. Very good for the electric lighted garden.

Louise Webster (1940); similar to Betty, the flowers last 26 to 28 hours. The tallest very early.

Maharaja (1942); very vigorous growth, slow propagator, strong scape about 3 feet high, widely branched, the 6 inch flowers dark orange red with darker shading below the middle of the petals, July. Rich color with very vigorous growth and unusually wide inflorescence.

Melo (1940); scapes 3 feet high, 3-4 inch flowers, pale brownish yellow with a darker arched halo on the wide petals, July. A delicious color combination like the flesh of a yellow peach.

Mrs. Jones (1938); a sport of an old early blooming variety with a tendency toward flowers with 7 to 12 segments, rapid propagation, 3 inch flowers yellow.

Mongol (1939); vigorous growth, good propagation, scape 3 feet high, flowers broad trumpet form, chrome yellow, 7 to 8 inches wide, petals nearly 2 inches wide, July blooming. This is the largest flowered hemerocallis I have seen.

Introduced by the New York Botanical Garden (Dr. A. B. Stout); for full descriptions of these clones see Journal N. Y. Bot. Gard. Jan. 1941:

Afterglow; capucine yellow, rosy tint in throat; 44 inches; early July to Aug. 12.

Aladdin; garnet-brown, golden cadmium with tinges of red-fulvous; 45 inches; mostly late June.

Autumn Prince; clear light yellow; to 42 inches; early Aug. to early Oct.

Baronet; orange, and Brazil red; 28 inches; June.

Bertrand Farr; pale orange and salmon red; 30 inches; July.

Bicolor; yellowish orange and pale fulvous red tinged with rose; 40 inches; July and August.

Brunette; yellowish orange, madder brown and tan-red; early, beginning June 1.

Buckeye; boldly banded, garnet-brown and cadmium-yellow; 30 inches; chiefly in late June.

Dominion; rich red; 40 inches; June 21 to middle July.

Harlequin; near to carmine and English red; nearly 4 ft.; mostly July but may extend to Aug.

Hiawatha; golden orange; 40 inches; climax latter half of July.

Mignon; lemon chrome; 40 inches; mid-June to August and into Sept.

Monarch; light cadmium, faint halo of fulvous; 3 ft.; July.

Port; Brazil red; 2 to 3 ft.; July.

Red Bird; vermilion-red; 3 ft.; July.

Sachem; dark red, and yellowish orange; 40 inches; July.

Symphony; bicolored, greenish yellow, yellow, rose-tinted; 44 ft.; mid-June to mid-July.

Triumph; rich orange and slight fulvous halo; 40 inches; July.

Yeldrin; uniformly yellowish orange; 40 inches; late July to mid-August.

Zouave; rich fulvous red, sepals lighter; 40 inches; June and recurrent in September.

Introduced by Ralph W. Wheeler, Winter Park, Fla.:

Turbani (A-46-2); First Class Certificate; Best Flower in the Show. National Hemerocallis Show of the American Amaryllis Society, 1941. Robust, with a large, very spreading flower. The compact throat terminates in very recurved sepals and in petals which start to recurve and then abruptly straighten out. The petals are pinched for the outer half of their length. The flower outline is definitely a triangle. This is a new break in flower form. In color it is a clear, medium deep orange. This flower is a semi-night bloomer which remains fresh all the next day, even in full Florida sunshine.

Halo (14-5-6); First Class Certificate. National Hemerocallis Show of the American Amaryllis Society, 1941. Robust. A large, wide open, shallow throated flower with very wide, frilled petals with twisted tips and wide, somewhat frilled sepals. In color it is light yellow with a faint dusting high up on the petals and again on the petal tips. Both in form and coloring an unusual Hemerocallis. This is a night bloomer which lasts all through the following day and stands full Florida sunshine about 90%.

Blackhawk (12-51-6); Semi-Robust. A medium sized, cup shaped flower with wide petals. The all over color is a very, very dark maroon, the darkest flower yet of my hybrids. The throat is bright gold. This flower stands full Florida sun all day like no other dark colored flower I have seen.

Dubonet (24-58-4); Semi-Robust. Medium size, intermediate form. The color is a bright maroon with a very definite violet tone. The sepals are lighter than the petals and the throat is canary yellow. This flower does not stand full sun, but is very beautiful before its color is dulled by too much light.

Duncan (24-113-2); Semi-Robust. A large flower with rather narrow sepals and petals. Intermediate form. The color is dark maroon, with a bright gold throat. It stands full Florida sun 60 to 70%.

Juno (26-25-1); Semi-Robust to Robust. A large flower with roundly recurved sepals and petals. The color is pale yellow with the deep throat the color of greenish ice, and with an equally cool look. A stately flower which holds up all day in full Florida sunshine.

Kadra (13-69-1); Semi-Robust. A medium large flower of intermediate form. The colors are the darker mahogany shades, sepals lighter than the petals and a very dark eye zone on the petals.

Luridum (24-130-2); Robust. A large flower with rather tightly recurved sepals and somewhat less recurved petals which are wide, frilled and the tips twisted. The color is a bright red on the scarlet, with somewhat lighter sepals which have narrow gold lines through them. The throat is greenish gold.

Ohred (F-55-5); Semi-Robust to Robust. A large flower, measuring up to 6½ inches, of intermediate form and with somewhat narrow sepals and petals. The color is bright red with a greenish yellow throat and yellow hair lines through the center of the petals. The greenish yellow of the throat forms a perfect six pointed star with a greenish center and golden halo. There are many flowers on a stem.

Porcellana (17-9-2); Semi-Dwarf. Small flower of intermediate form with narrow sepals and petals. It is the color of aged ivory with a pattern formed by the darker hair line veining.

Rose Marie (14-26-2); Semi-Dwarf. Small, cup shaped flower with sepal and petal tips acutely recurved. The petals are a light antique rose, the sepals being dusted with the same color. The throat is a pale, clear yellow. This flower stands full sun about 85%.

Solador (14-13-1); Robust. This is a very large flower with very wide sepals and petals, whose tips are roundly recurved. The flower diameter is 6 inches, petal width 2 inches and sepal width 1¼ inches. The color is deep yellow, with a faint, dusted eye zone high up on the petals. The flower texture has a very silky appearance. This is a semi-night bloomer and remains fresh all the next day, standing full Florida sun about 90%.

Tiger (E-33-2); Robust. A large flower of intermediate form. Dark fulvous colors on a ground color of yellow-orange, with darker fulvous red eye zone and yellow-orange throat simulate the pattern and coloring of the tiger's coat.

Tonquin (24-138-1); Robust. A large, wide open flower identical in form and size with Turbani, of which it is a half sister seedling. The flower color, however, is quite different. The throat and ground color is a gold orange. The sepals are dusted a mahogany red while the petals are colored mahogany red with a slightly darker eye zone. It stands full Florida sun all day.

Introduced by L. Ernest Plouf, Craemore, Lawrence, Mass.:

Apropos (1941); July; fragrant, very full, round; outer segments embossed at edges; inner deep bronze-red with broad cream midrib, incurve at tips, wavy edges; outer segments paler; orange throat, heavy substance.

Brazen Ego (1941); July; 4 ft.; large velvety bright maroon-red; bright red-orange throat; broad orange-yellow midrib on inner segments; deeper red zone; open; flaring; heavily colored, bold; heavy substance; well formed; very full; red deepens outward from midrib area; keeps well; robust.

Capricious (1941); Aug.-Sept.; all segments rose-pink, slightly deeper zone blending upward; soft canary throat in good contrast; round tips; good substance; keeps well.

Chilton (1941); somewhat fragrant, large very full flower heavily toned purple-rose; outer segments a bit lighter; green-yellow throat; round outline; no eye-zone; flatly open; unusual quality of fragrance.

Comtess de Vysart (1941); 4 ft.; unusual color-pattern; high throat of bright gold framed beautiful deep rust; remainder of inner segments orange-rust with white midrib and decidedly crinkled edges; outer ones flushed paler shade; roundly recurved; good form; stiff tall stem; very sun-resistant.

Coralpiece (1941); 3 ft.; all segments decidedly rose-pink, veined deeper; green-canary throat; no eye-zone; increases rapidly; floriferous; sturdy stems.

Craemore Henna (1939); July 3 ft.; bright henna; ruby iridescence, excellent size, form and texture; deep orange throat; inner segments solid henna; all segments ruby along veins. Outer segments deep orange heavily flushed henna. Reverses rich orange in sharp contrast; upright funnel-shaped; wide open; full; well recurved; clean habit; good foliage; deciduous; keeps well late.

Craemore Ruby (1938); July 3 ft.; intensely red blooms; full, 5" flower; yellow-green throat; deep ruby red covering entire inner segments, darker veins. Outer segments slightly lighter, wide open. Ruby reverses on inner segments; darker zone; velvet texture; excellent heavy substance; compact clump; good in formal garden. Keeps well after dark.

Domination (1941); July 20; deeply colored lavender-rose inner segments; deeper cold-tone framing canary throat; outer segments paler, well flushed rose; roundly recurved; large; robust; tall; keeps well late.

Utopia (1941); July 20; very large; shoe-horn-concaved inner segments, very crinkled edges, recurved, cream midrib; yellow-orange throat, almost no deeper zone; inner segments bright deep bronze; outer ones flushed same color. Good substance.

Finesse (1941); July-Aug.; all segments even toned peach; full; bright gold throat; inner segments crinkled; outer crinkled and embossed; round outline; distinct from *fulva rosea* form; soft colors; keeps well late.

Fulva Rosea Pastelrose (1939); July-Aug.; 4½ ft.; a wild plant from China. Same form and size as *Fulva Rosea Rosalind* but without deeper zone; much more pink; taller; raised cream-white midrib on inner segments, less prominent on outer; keeps substance well; even more pink at end of day.

Garnet Velvet (1941); July 10; 5 ft.; very deep garnet, all segments even toned; full firm even form; edges somewhat wavy; circular outline; wide olive-yellow throat; heavy substance.

Hannah Dustin (1937); July 3 ft.; fragrant; full; clear lemon, greenish throat; excellent form; heavy substance; firm, well open; 3¼" flower, floriferous; deciduous, fine cut flower.

Harbinger (1941); May 28; fragrant, very full; bright golden yellow; stiff erect stems; very heavy substance; keeps very well to end of day.

Harvester (1941); Aug.-Sept.; broad incurved inner segments, deep peach; outer segments a little paler, embossed, crinkled and recurved; round outline; orange throat; flatly open.

Herald (1941); May 28; early fragrant lemon; tall erect stem, very well branched; full flower; good keeping quality; heavy waxy substance.

Holildred Yeld (1941); fullest and most recurved of all; segments are broad and curl way back; round outline; lavender, veined deeper; large flower; keeps well end of day; named after a daughter of the late George Yeld—the pioneer of daylily hybridizing.

Indian Summer (1941); Aug.-Sept.; fine shade of burnt-orange, olive cast; shoe-tongue-formed inner segments, broad and rounded at tips, decidedly crinkled edges, roundly recurved; narrow outer segments not recurved; good form; well open; good substance.

Jocelyn (1941); June 14; 3-4 ft.; very large rather flaring; intermediate season; sturdy stem; heavy chamois substance; slight fulvous tint at eye-zone; rich orange; keeps very well until after dark.

Whittier (1940); August 4 ft.; fragrant flaring 6½" flower, flatly open, gracefully spreading; bright canary; throat-base and reverses of outer segments green; good substance, sun-resistant, erect stem. Named for the poet whose birthplace is a few minutes' walk from where this daylily was raised.

Jolly Roger (1941); July 17; darker parallel veining on all segments a distinct characterization; orange throat; purple-maroon zone blending gradually to deep rose on broad inner segments which have distinct broad buff midrib; outer segments same rose becoming buff at tips; unusually even, firm form; fine substance; waxy-chamois finish; all edges deckled; large flower opening late, closing late.

Kajin (1941); July 24; very full; roundly recurved; deep rose blotch; rose-orange; crinkled edges; wide olive-yellow throat; fine form.

Kinyo (1941); July 10; 3 ft. fine distinct form; triangular spread; rich Chinese yellow; contrasting rose blotch bisected by cream midrib; inner segments very full and curl a bit; outer ones narrow, open; sun-resistant.

Madelon (1941); July 14; seventy or more 5" flowers; deep orange, throat blended greenish, framed with deep rose eye-zone; inner segments deep peach; decidedly crinkled edges; broad pale cream midrib; outer segments paler; firm substance; good form; open; full; very robust; keeps well.

Madrepore (1941); July-Aug.; unusual chalice-formed; segments deep bright coral; wide orange throat; very tall erect stem; not recurved, open; quite full; keeps well.

Merrimac (1940); Aug.-Sept.; 4 ft.; orchid-like crinkling, peach colored 4" flower; orange throat framed with a bright rose zone; darker veins on inner segments; full; embossed outer segments; very well branched; widely open; deciduous; floriferous.

Piper Trail (1941); a pale raspberry self; almost no midrib color; dull bright finish; crinkled; good form; open; rather round outline; keeps well end of day; tall stem.

Purple and Cream (1941); Aug.; 3 ft.; very full; strongly bicolored; outer segments evenly toned cream; cream-white midrib on broad spatulate inner segments, blades heavily dusted deep purple, deeper at zone framing a yellow throat; all segments decidedly crinkled at edges; heavy substance; keeps well.

Red Aroma (1941); a fragrant red; fine deep raspberry-red on all segments; large flower; roundly recurved; long segments; round outline; yellow-orange throat.

Rythmic (1941); July 20; very full and round; tips of inner segments rounded; orange throat; inner segments bronze-rose; crinkled edges; cream midrib; keeps well end of day.

Rosaflare (1941); July; 2 ft.; large deep pure rose, veined deeper; outer segments paler; 5" flower; wide lemon-yellow throat; good form; heavy waxy substance; keeps well until after dark.

Tresjolie (1941); July-Aug.; 3 ft. fine distinct form; canary throat; large even-toned lavender-rose blotch edge of throat, remainder of segments pale peach-cream; well open.

Tulip Effigy (1941); 3 ft.; July 13; formed like a lily-flowering tulip; somewhat fragrant; tips of inner segments flare; not recurved; pale cream; high lemon throat, deeper color at midrib; inner segments, at throat edge, speckled purple, then rose becoming paler, tips pale cream; outer segments slightly speckled rose; reverse of inner are lemon; good substance; keeps well.

Vadonna (1941); July 20; 2½ ft.; segments strongly blended purplish-red-fulvous; outer segments deeper and speckled deep fulvous—deeper still along veins; yellow throat olive-cast; faint halo; waxy substance; erect stem; well branched; well open; keeps well.

Warren Hutchings (1939); July-Aug.; 3 ft.; large brick-red flower; very broad spatulate inner segments, flatly open, narrow throat; blooms open late and keep form and color until well after dark; deep orange throat; dark green foliage; strong erect stems; bold and unusual.

Zakura (1941); 3½ ft.; large, full, well open flaring flower; all segments decidedly peach, red-orange veining; wonderful contrast to bright deep gold throat; very sun-resistant; tall stem.

HYBRID AMARYLLIS CLONES

Introduced by Ralph W. Wheeler, Winter Park, Fla.:

Lord Amherst (#188); First Prize in its Class; First Class Certificate; Best Flower in the Show. National Show of the American Amaryllis Society, 1941. Leopoldi, Type A. Very large flower, 9 inches, with an unusually flat face. There is some frilling of the petal edges in the center of the flower. The color is a solid, dark crimson with decided violet tones.

Jefferson (#189); First Prize in its Class; First Class Certificate. National Show of the American Amaryllis Society, 1941. Reginae, Type A. This is a very large flower, 9 inches, with wide, recurved

segments which form a convex face. The color is a clear, medium dark red, clean color to the throat.

Carmen (7-17-7); Leopoldi, Type A. A very large flower, $8\frac{3}{4}$ inches, petals 4 inches wide. The funnel is shallow and the face of the flower is only slightly convex. A most handsome form. The color is crimson, the violet tones not being very pronounced.

Flamingo (6-50-7); Leopoldi, Type A. A large flower, $8\frac{1}{4}$ inches, with very wide, slightly recurved petals, producing a flower of good form and rich beauty. The color is a very deep rose pink, shading on the outer edges, particularly in the lower petals to a shell pink. The lack of pattern in the coloring and the colors themselves suggest the informal plumage arrangement of the Flamingo.

Glamour (#202); Reginae, Type B. A large flower, 8 inches, with wide petals, but with pointed tips in the manner of Type B. The color is the cleanest snow white with deep wine red splotches and feathering from the throat, on the three upper petals and on the upper halves of the two lower side petals. A striking flower.

Lady In Red (8-21-3); Leopoldi, Type A. A large flower, $7\frac{3}{4}$ inches, of fine Dutch form with a slightly convex face, very wide petals with frilled edges in the center of the flower. The color is a beautifully brilliant scarlet which shows the orange tones only in the lighter parts. The center of the flower is satiny in texture and deeper in color.

HABRANTHUS CLONES

Introduced by Hamilton P. Traub, Beltsville, Md.:—

Orlando (*H. brachyandrus* x *H. robustus*); shape of perigone-segments and flowering habit like *H. brachyandrus*; color of segments orchid pink like *H. robustus*; filaments light red.

Argentina (*H. brachyandrus* x *H. robustus*); intermediate between parents; shape of perigone-segments like *H. brachyandrus*; color slightly deeper pink than *H. robustus* and lighter toward center; only slight suggestion of wine color in throat; filaments light red.

ARGYROPSIS CLONES

Introduced by Hamilton P. Traub, Beltsville, Md.:—

Buenos Aires; segregate from self pollination of *Argyropsis candida major* made at Mira Flores, Orlando, Fla., in 1936; opens light yellow, fades to almost white. Habit of *A. candida major*.

Elizabeth Traub; of same parentage as *Buenos Aires*; opens medium yellow, fades to light yellow. Habit of *A. candida major*.

4. CYTOLOGY, GENETICS AND BREEDING

INHERITANCE IN DAYLILIES

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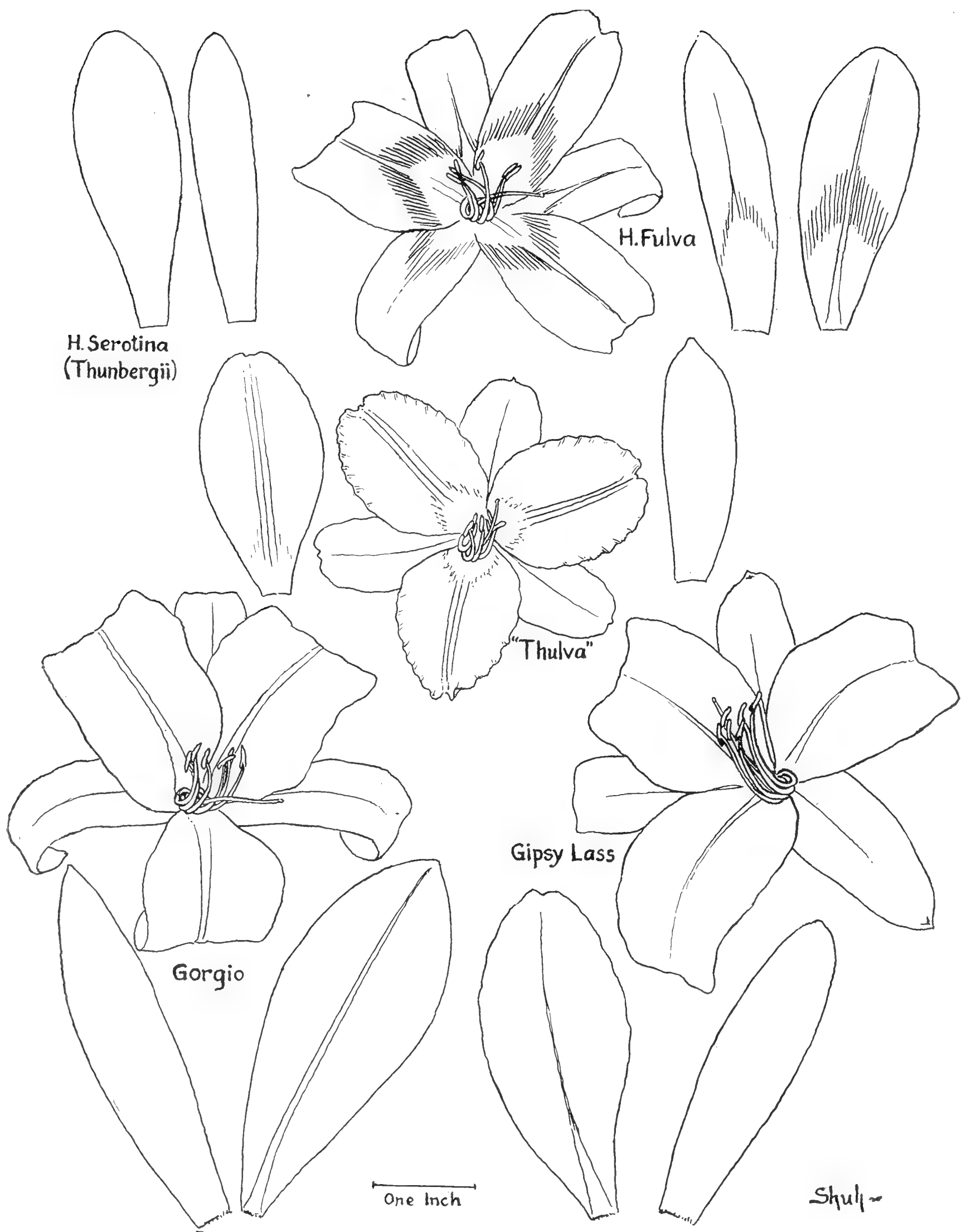
As yet little has been published regarding the genetics of *Hemerocallis* and of course nothing of importance can be contributed along this line by the hit-and-miss methods of "breeding" indulged in by many producers of new varieties at the present time. Only by carefully controlled matings of known species and varieties and well kept records of results, can such information be accumulated, to serve, and perhaps to save the time of, future daylily breeders.

It is quite possible to produce beautiful horticultural varieties by merely sowing the seed initiated by roving insects for it is only necessary to grow huge numbers of seedlings and select the best of them for distribution. Many of our fine varieties have originated in just this way but it would seem that a less wasteful method might be found through accumulation of data regarding their genetic behavior.

The notes here presented are confessedly meager and little more than a challenge, but they may serve as a stimulus for further work. They deal with the mating of *Hemerocallis serotina* (syn. *H. Thunbergii*) with *H. Fulva Europa*.

From its characteristics and behavior we must think of *Europa* as something less than a pure species, unavailable for selfing, but its pollen can be used on species that are fertile. In the case here reported *H. serotina* received the pollen of *Europa*. Only three offspring resulted from this union and two of these when they came into flower were outwardly not distinct from the seed-parent. The other, however, was very distinct from either parent. Petals were much broader than in either *Europa* or *H. serotina* (See Plate 210). The color was a bright orange body color strongly overlaid with red in the central portion of the flower but without *Europa's* distinct eye-zone. Diameter of flower is about the same as in *H. serotina*, not large, but owing to the greater width of petals producing what is known in daylily parlance as a "full" flower.

There has been no thought of introducing this variety, which for purposes of record was designated as "*Thulva*", but because it shouted its hybridity all over the premises it was chosen for further breeding work. True to general experience with hybrids it sets seed with considerable reluctance, about one in twenty pollinations resulting in seed. Seed was obtained from pollen of what I have as *Florham*, and also with pollen of *Iris Perry*. Petal and sepal tracings are presented from both of these matings. It is notable that although the origin of wide petals is not obviously inherent in either of the grand-parents, *Europa* or *H. serotina*, nor in the subsequent pollen parents, *Florham* or *Iris Perry*, nevertheless the wide petal character has carried on to the generation represented by *Gorgio* and *Gipsy Lass* (See Plate 210). *Gorgio* is a bright clear yellow self with a conspicuous near-white midrib, reflecting



Petal and sepal tracings and face views of three generations of daylilies. HEMEROCALLIS SEROTINA X EUROPA producing "THULVA"; "THULVA" X FLORAM producing GORGIO and "THULVA" X IRIS PERRY producing GIPSY LASS. See text for further details, pages 93 and 95.

in its color that of *H. serotina*, its maternal grandparent, as well as that of *Florham*, its immediate paternal parent. *Gipsy Lass* retains the orange color of both its immediate parents but discards the quite narrow petallage of the paternal *Iris Perry*.

In the absence of statistical data based on the sibs of *Gorgio* and *Gipsy Lass* these meager notes may not be of very great significance, but I have the impression that the wide petal character is quite prevalent among them and may be looked upon as a definitely heritable character.

REPORT ON INTER-SPECIFIC HYBRIDIZATIONS IN HEMEROCALLIS

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This report presents the list of the inter-specific hybridizations that have yielded seeds in the breeding work done at The New York Botanical Garden during the past twenty-five years. References are made to the most important of the publications which give information on matters that are mentioned and these references are listed at the conclusion of the text. For convenience in presenting a compact tabulation, the species and certain clones are listed alphabetically and numbered consecutively. For each combination the seed parent is named first and the pollen parents are then indicated in numerical sequence. It should be noted that this tabulation does not include any of the numerous pollinations made (a) for later generations than F_1 , (b) for selective breeding after hybridization, (c) for intra-specific breeding, (d) for the hybridizations of hybrids with species other than their own parents, and (e) hybridizations which involve several types of daylilies that may later be described as new species. Also it does not include inter-specific pollinations which have failed to yield seeds.

THE TABULATION

1. *H. aurantiaca* x 2, 4, 5, 6, 7, 10, 11, 12, 13.
2. *H. aurantiaca* clone *Major* x 4, 5, 6, 7, 10, 11, 13, 15.
3. *H. aurantiaca* var. *littorea* x 8, 10, 11, 13, 15.
4. *H. citrina* x 1, 2, 5, 10, 13.
5. *H. Dumortierii* x 1, 2, 6, 8, 9, 11, 12, 13, 14, 15.
6. *H. esculenta* x 1, 2, 4, 5, 7, 8, 9, 10, 11, 12, 15.
7. *H. exaltata* x 1, 2, 4, 5, 6, 8, 9, 10, 11, 12, 13, 15.
8. *H. flava* x 1, 4, 5, 6, 7, 9, 10, 11, 12, 14, 15.
9. *H. Forrestii* x 2, 4, 5, 8, 10, 11, 12, 13.
10. *H. fulva* x 1, 2, 3, 4, 5, 6, 7, 8, 11, 12, 13, 15.
11. *H. Middendorffii* x 1, 2, 3, 4, 5, 6, 8, 9, 10, 12, 14, 15.
12. *H. minor* x 1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15.
13. *H. multiflora* x 1, 3, 4, 5, 6, 10, 11, 12, 15.
14. *H. nana* x 5, 12.
15. *H. Thunbergii* x 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13.

COMMENTS

Taxonomic considerations. The name *H. aurantiaca* Baker (1, 5, 7, 24, 26, 32) was given to a single plant that had pale fulvous flowers as have many individuals of *H. fulva*. This one plant was propagated as a clone. No seeds have been obtained from the members of this clone to any self-, close- or intra-clonal pollinations. The breeding behavior, judged by hybrid progenies, indicates that this clone is heterozygous for such important characters as fulvous coloring in flowers and evergreen habit of growth (35). Several clones are being distributed under the name "*H. aurantiaca*" which are not like the clone described by Baker.

The "*H. aurantiaca Major*" Baker (2, 24, 26) is also a clone. Its flowers do not have fulvous coloring. It seems to be homozygous for absence of fulvous coloring and for the evergreen habit. It may indeed belong to a wild type that merits a specific name.

Of the *H. aurantiaca littorea* (Makino) Nakai (3, 5) the New York Botanical Garden has received from Professor Nakai two plants that are evidently divisions of one plant. The flower coloring is pale fulvous similar to that of *H. aurantiaca* and many plants of the *H. fulva*. The capsules are more typical for *H. fulva* than for the *H. aurantiaca*.

Of *H. flava* (9, 26, 30, 32) there are evidently two or possibly three main clones of which one has long been known in Europe. No plant closely resembling this one clone, which Linnaeus named as his type of this species, has yet been described or collected in the Orient. The name *H. flava* has, however, been applied to many of these plants.

In the above tabulation under the name "*H. fulva*" there are listed the F₁ hybrid seed progenies obtained with *H. fulva* clone *Europa* (14, 15, 26) and with those wild plants obtained directly from both China (including *H. fulva rosea* [18, 26, 32, 34]) and Japan which are at present included in one species. The characters ascribed to the *H. disticha* Donn and to the *H. longituba* Miquel (5, 14, 15, 26) are minor variations commonly seen in the group here considered as the one species. Breeding with the double-flowered clones of *H. fulva* (*Flore Pleno*, *Green Kwanso* and *Variegated Kwanso* [14, 15, 26]) has mostly been intra-specific.

The name *H. esculenta* here includes a group of wild plants obtained from Japan and seedlings obtained from selfing and crossing some of them. These plants conform closely to the descriptions and illustrations given by Nakai (5) for the species *H. esculenta*. It is now evident that this species does not have "rubra luteis" flowers as first described by Koidzumi (4, 26) but does have clear orange colored flowers most like the *H. Middendorffii*.

For the species *H. citrina* (16, 26, 32), *H. Dumortierii* (8, 26, 29), *H. Middendorffii* (10, 26), *H. minor* (11, 26) and *H. Thunbergii* (13, 26) the New York Botanical Garden has plants that are either definitely known to be of the older clones first described as the types of these species or clones long cultivated in Europe and also there are of each of these species plants recently obtained in considerable number from the wild in the Orient.

Of *H. exaltata* (26, 27) and *H. multiflora* (12, 19, 26) there are all the original plants obtained from the wild that were considered in the descriptions of these new species and also there are progenies of seedlings from both groups. Seedlings of *H. Forrestii* (26) have been grown from seeds collected in China. Of numerous plants obtained as *H. nana* (26, 29) only a few have been correctly named.

It should perhaps be stated that plants are being distributed in Europe and America under the names *H. nana*, *H. Forrestii*, *H. minor*, *H. Thunbergii*, *H. flava* and *H. multiflora* which do not conform to any specific name and which are obviously hybrids or aberrant individuals.

Cold treatment for seeds. At the New York Botanical Garden the seeds of daylilies are, as a rule, planted in seed pans during late summer or early autumn. Usually there is prompt germination. But there are seeds which rot in the seed pans without germination, unless they are given cold treatment (35). When seeds do not germinate within a few weeks after they are planted they are usually placed in a refrigerator at a temperature slightly above freezing for a period of about six weeks after which there is often prompt germination.

Inter-specific hybridizations that have failed. For the pollinations that have been made with the daylilies listed in the above tabulation only two combinations have failed to yield seeds in *both* of the reciprocal relations. These are *H. aurantiaca* with *H. Forrestii*; and *H. aurantiaca* clone *Major* with *H. flava*.

A number of inter-specific relations readily produced seeds when one species was a seed parent but repeatedly failed to produce seed when the other was the seed parent. There were only six failures among all the inter-specific relations that were tested in only one of the two possible reciprocal pollinations. In five of these a plant true for *H. nana* was the pollen parent.

In daylilies there are several somewhat special conditions aside from fundamental specificity that influence and even determine whether or not fertilization will follow pollination. The day-blooming, the night-blooming and the extended-blooming daylilies (25, 26) differ in respect to the time of the day when pollinations are most effective. Changes in weather produce irregular and abnormal opening of sets of flowers. For hybridizing pollination between parents that flower at different calendar dates, pollen that had been stored was often used and it was not always convenient to test the viability of the pollen.

The record for H. nana is of special interest. The species *H. nana* is, it now seems, the only one of the genus which has solitary flowers that are terminal on the main scape and on the few laterals (usually one or two) when these develop on a scape and also for this species there are no traces of secondary laterals or of their bracteoles which in all other species are either present to form bostryxes or evident in a rudimentary condition (36).

H. nana has hybridized both as a seed and as a pollen parent with *H. Dumortierii* and with *H. minor*. It has hybridized as a pollen parent with *H. flava* and with *H. Middendorffii*. But all the F₁ hybrids thus

far obtained which have *H. nana* as a parent are almost completely sterile from the abortions of microspores and macrospores. This sterility from hybridization is so strong in these hybrids that only a few seeds have been obtained from thousands of the flowers over a period of several years. Of the inter-specific pollinations which have been made, there were no seeds when *H. nana* was a pollen parent with *H. aurantiaca*, *H. aurantiaca* Major, *H. citrina*, *H. esculenta*, *H. exaltata* and *H. fulva*.

Horticultural values. Very few of the F₁ hybrids grown at the New York Botanical Garden have even been considered in selecting plants for horticultural culture.

Of the hybrids obtained from certain relations, individuals can be selected which closely resemble most of the earlier clones that were introduced, as, for example, the *Tangerine Daylily* and the *Gold Dust Daylily*. The more distinctly new and outstanding seedlings which have been propagated and introduced as clones (Mikado [19, 22, 26], Wau-Bun [20, 22, 26], Bijou [23, 26], and Theron [26, 28], etc.) were obtained after repeated hybridization had increased diversity and then often there were several generations of selective breeding (6, 22, 26, 28, 27, 31, 32, 37, 38).

There has, however, been selective breeding within certain species. The best and clearest shades of rosy-pink and pink colors without the eye-zone in flowers were obtained by intra-breeding plants of the botanical variety *H. fulva rosea*. But hybridizations of these plants resulted in greater diversity in the shades of color and also there were different forms and sizes of flower and plants widely diverse in stature, in habits of growth, and in season of flowering.

Genetical results. A discussion of the genetical results obtained in the breeding work with *Hemerocallis* was presented in the program of the Seventh International Genetical Congress held in Edinburgh, Scotland in August 1939. An abstract of this was published in the Proceedings of this Congress (37). Few of the readers of *Herbertia* will see this volume and as there are no separates of the abstract it may be somewhat appropriate to republish it here. It is as follows:—

“The recognized species of *Hemerocallis*, about fifteen in number, possess wide diversities in such important features as stature, habits of growth, season of bloom and flower characters (as size, colouring and flowering behavior). Except for the several triploid clones in the species of *H. fulva*, all species are, it appears, diploid with $2n=22$ chromosomes. There are some inter-specific hybridizations that fail and certain F₁ progenies have not yielded seeds to any pollination*; but many hybridizations between species that are widely different have been accomplished. As a rule, in the F₁ hybrids there is either some degree of dominance or some degree of intermediate expression for the sharply contrasted characters of species used as parents. In only a few cases do decidedly new and unexpected characteristics appear in the F₁.

* This statement refers especially to the F₁ hybrids which have **H. nana** as one parent. A few seeds have now been obtained on **some** individuals of most of these progenies. Possibly from such seed fertile allotetraploid plants may be obtained.



New York Botanical Garden

View of experimental greenhouse, New York Botanical Garden, March 1939; in front, Dr. A. B. Stout and Dr. Clyde Chandler; in rear, with coat on, Mr. Francis Cataldi. Asst. for two years supplied by W. P. A., and Mr. Michael Murphy, gardener since 1931. Note daylily seedlings in center bench.

See page 101.



Felda Griffith, N. Y. Bot. Gard.

See page 101.

Upper, view of New York Botanical Garden experimental daylily breeding plots; lower, Dr. A. B. Stout at work.

But numerous rather distinctly new expressions for various characters are obtained when hybridizations, especially those which involve several species in the parentage, are followed by selective breeding. These may be due (a) to recombinations which involve two or more pairs of contrasted characters, or (b) to distinctly new expressions. One example of the latter is the intensification of pigmentation which resulted in flowers which have dark mahogany red colouring. First there was hybridization which involved yellow-flowered species and species with fulvous flowers. The F₁ had pale fulvous flowers and of the F₂ none had flowers that were darker than the more fulvous parent. Then plants which showed the greatest degrees of anthocyanin pigmentation were used as parents in further breeding and in backcrossing. In the fifth generation a progeny of sixteen plants was obtained, all of which had degrees of dark red pigmentation not seen before in any day-lily. The various complementary factors which interact to intensify anthocyanin pigmentation in the flowers were brought together by hybridization and by the subsequent selective breeding into relations which produced a new type that had hitherto not been in existence. Thus in selective breeding after hybridization of *Hemerocallis* various specific characters may be modified for the development of distinctly new horticultural types of day-lilies."

Inter-generic pollinations. Perhaps mention should be made here that numerous controlled reciprocal hybridizing pollinations have been made between various species and types of *Hemerocallis* and *Hosta*. Professor John V. Watkins made most of these during 1936 and 1937 while at The New York Botanical Garden on a scholarship basis. The writer has also made numerous of these pollinations over a series of years. A few seeds were obtained from one pistil of a *Hemerocallis* plant but the seedlings grown were purely daylilies indicating either lack of control in the pollination or apogamy.

Acknowledgment. During the thirty years of research with *Hemerocallis*, of which this paper reports a small part, the writer has had the efficient and valued assistance of several assistants, numerous students, recipients of scholarships, volunteer workers, and also helpers supplied by the Works Progress Administration in experimental work, in clerical work, and especially for paintings by artists. During the past few years the task of compiling the records of inter-specific hybridization and of making further inter-specific pollinations has been the responsibility of Dr. Clyde Chandler, Technical Assistant to the writer since 1927 (See Plate 211). The most noteworthy expansion of the research with *Hemerocallis* was made possible in 1930 when Dr. Elmer D. Merrill, then Director of The New York Botanical Garden, allotted the area, shown in Plate 212, to the writer for the studies in experimental breeding. To Dr. Merrill especially and also to others in the administration of the N. Y. Botanical Garden the writer here records his deep appreciation.

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BREEDING FOR GOOD RED DAYLILIES

WYNDHAM HAYWARD, *Florida*

Until good, bright, clean "reds" of pleasing full shape of flower are obtained by the daylily breeder, this phase of *Hemerocallis* hybridization will remain one of the most attractive avenues of discovery for the "plant explorer."

Probably the "reds" would have come into popularity without the introduction of *H. fulva* var. *rosea*, one clone of which has been given the garden name *Rosalind* by Dr. A. B. Stout. Before receiving the original plants of *H. fulva* var. *rosea* from Dr. A. N. Steward in China, Dr. Stout, who first took up the serious breeding of "red" daylilies, had developed a series of hybrids in this color class. The availability of the wonderfully significant *H. fulva* var. *rosea* opened wide the door to an amazing vista of breeding possibilities in the darker daylily shades.

Dr. Stout is to be congratulated on having made available plants of the rare, rose-colored, wild Chinese daylily to *Hemerocallis* breeders and fanciers in England and America. The garden world owes its congratulations to Dr. Steward for his perspicacity in sending back to the United States plants of the *H. fulva* var. *rosea* collected in China. All scientific progress is a matter of cooperation, and as a result of the generous distribution of the fundamental breeding material which has been made possible in recent years, back yard gardeners from Seattle to Miami are feverishly growing seedlings of the "red" shades of day-lilies.

Hemerocallis fulva var. *rosea* seems to be quite infertile to its own pollen. When carefully handpollinated with the pollen of other species or hybrids, it will set seed, sometimes in fair abundance, and from these first generation seedlings come some noteworthy surprises. The shades are usually not outstanding or striking in the first generation of flowers. Some will be coppery, some apricot-like, a few very dark maroon, and many in various brownish shades. A few seedlings, out of many, will have possibilities for further breeding of pink or true reddish colors.

Cross breeding between these seedlings of *H. fulva* var. *rosea* will give most interesting results, clearer colors, better forms, new shades, approaching chocolate, purple, wine, and even scarlet tones. From this point on, the future possibilities are almost unlimited, depending only on the care and enthusiasm and facilities of the hybridizer.

Of one thing the hybridizer may be certain, surprises—and he will also have more than his share of disappointments. If he obtains one new and outstanding type in a batch of one to five thousand seedlings he will be more than lucky. The great proportion of his "red" seedlings will not even be red, but a kaleidoscopic range of lighter or darker off-shades, usually on flowers of inferior shape and quality.

The achievement of obtaining a fine clear red *Hemerocallis*, with a flower of good shape, size and texture, will be the result of pure good luck or the most unremitting research and care in breeding, or both. It is a goal worth aiming at, and capable of inspiring the minds of plantsmen for years to come, in all probability. It will come, but it will take time, like anything worth while in horticulture.

DAYLILY BREEDING ROUNDUP

The Daylily Breeding Roundup was begun in 1940 *HERBERTIA* with brief articles by eight of the younger daylily breeders: (1) Robert Schreiner, (*Minnesota*); (2) J. Marion Shull, (*Maryland*); (3) John V. Watkins, (*Florida*); (4) Elizabeth Noble Nesmith, (*Massachusetts*) [article by Mrs. Ethel P. Dewey]; (5) Wyndham Hayward, (*Florida*); (6) Leon H. Leonian, (*West Virginia*); (7) Elmer A. Claar, (*Illinois*); (8) Hamilton P. Traub, (*Florida*). The Roundup is continued in this issue with brief articles by additional daylily breeders.

There are still other of the younger daylily breeders to be heard from, and for their information it should be stated that this Roundup will be closed in the 1942 issue of *HERBERTIA*. Do not delay in sending in your brief article on your daylily breeding activities.

—*Hamilton P. Traub.*

PRODUCING NEW DAYLILIES

J. B. S. NORTON, *Maryland*

Twenty years ago we acquired a new place to live on, with an acre of woods around the house. In looking for flowers that could be grown in shade, among other things, hemerocallis was recommended. We planted some *H. Flava*, single and double *H. Fulva*, some unknown clones, and soon bought the early Stout clones. In a few years it was found that they were blooming less and less in the woods, but did well in moist open ground.

Under the inspiration of Dr. Stout's brilliant work, I began to pollinate and save some seeds for the purpose of raising new clones, until now I harvest about 20,000 seeds a year, which is far more than can be grown on the acre or two we started with; but a great many beautiful and interesting selections have been made with a great deal of pleasure and satisfaction, and even frequent thrills from seeing new kinds come into bloom, often of types that could not be obtained on the market without waiting years.

Having plenty of science in my daily work, and carrying on the daylily production from an artistic standpoint, I have left the genetics largely to professional experts, and have methods, if they can be called methods, that will produce large numbers of crosses, with selecting and discarding as the main work. So far as feasible, pollen is put on all the flowers in the garden, every day, which, here near Washington, D. C., means from late April to late October. No bagging, emasculating, labeling or recording of parentage is done, except that seeds are kept separate from some more promising seed parents.

Stamens from which pollen is desired are carried around in the hand and the loose pollen touched to the stigmas, in general putting those together that seem more likely to make the desired combinations. The main interest is in seeing what the offspring will be like, rather than

in knowing their parentage. The heavy load of seeds produced may reduce growth and propagation of the plants, but if so, it has not been noted.

The mathematical chance of getting new kinds is very great. If all the combinations of characteristics noted could be made, the number of distinct kinds that could be distinguished would run into the billions. This indicates a field of effort large enough for everyone who wants to go into it to work for many years without exhausting the possibilities.

When the pods begin to crack, they are gathered and generally shelled the same day. If allowed to lie in unventilated masses, a rapidly growing white fungus softens the green pods. Some of the early kinds are planted in summer. Most of the seeds are sown thickly in open rows, October to December, or even in January, and again in March and April. Early spring and late fall sowings do about equally well. Some choice kinds are grown in the house in winter, and this gives them a little advantage. I have had a greenhouse grown plant to flower in 11 months from seed. The garden grown seedlings bloom in two to four years.

If I had plenty of ground, I would sow thickly in beds and transplant one year seedlings three to six inches apart in rows, discarding the inferior ones as they bloom and setting the selections into well-spaced rows. As it is now many of them have to be left to fight it out growing too thickly together.

The plan of selecting and breeding to an ideal type does not seem to me as good as to try to get many new kinds with beauty and quality, looking for new types not yet attained. This keeps up interest which is lost as the ideal is approached. Yet I have had some ends in view, some of which are being reached, and others for which there is little hope. There was a dearth of pinks, and with no pinks to start with I got creamy pinks in the second generation, and out of these, a practically pure pink this year. Whites tried for do not seem very promising. Many kinds of extra organs have appeared in petals, stamens, and carpels, but no real doubles as yet. I have tried to select some good fragrant night bloomers to fill a real need for cut flowers, moonlighted and electric-lighted gardens, and especially, for the majority of our gardeners who are away from home during the day, and our flower shows which are attended mostly by night. The main present interest is in color patterns other than spots, halos and bicolors.

AIMS IN DAYLILY BREEDING

C. W. CULPEPPER, *Virginia*

At present it seems that the principal object in growing daylilies from seeds is the production of new clones with superior qualities in the vegetative form of the plant or in the flower, the improvement of the flower being the most important. This is very well but propagation by seeds may be useful from another point of view. There are many

beginning garden-enthusiasts who feel that they cannot afford to purchase the assortment of clones necessary to secure a wide range of desirable color forms. This difficulty may be avoided by growing the plants from seeds. It is a simple matter to produce seeds that will give plants with flowers of the desired color range. By choosing a few good seed bearing parents and pollinating their flowers with a mixture of pollen from some of the better varieties the resulting seeds will produce plants that are the equal of any except the very expensive clones. In my own garden I have found that *Rajah*, *Stalwart*, *Hyperion*, *Gold Imperial* and *Vulcan* are good seed bearing parents. When these clones are pollinated with a mixture of their own pollens, the seedlings produce flowers of good quality. From a hundred or so such plants individuals may be selected that for all practical purposes will be the equal or superior to three fourths of the varieties that are generally offered by the trade at the present time. Among the early varieties *Dr. Regal* and *H. minor* produce seeds abundantly. No doubt there are many other varieties that would be satisfactory as seed bearing parents. Mediocre parents should never be used and the latest and best should be chosen where available. It would seem that seedsmen should not overlook this possibility of serving their customers.

My chief interest in growing seedlings has been the production of better early varieties particularly red-flowering forms. So far little has been accomplished. I am also looking for types that are more dwarf than those commonly grown. Improvement in floriferousness as well as in color and size of flower is desirable in the dwarfs.

A few seedlings of *Rajah* x *Vulcan*, and *Vulcan* crossed with other red forms, have been grown. Among these is one that is slightly deeper in color than *Vulcan* and borne on a taller, better branching stem. It will have to be tested further to determine whether it is sufficiently superior to warrant introduction.

DAYLILY BREEDING AND TESTING AT CRAEMORE

L. ERNEST PLOUF, *Massachusetts*

Our first object was to collect as many known clones as possible so that our breeding would begin at a point where daylily hybridizing had been advanced by others. Importations were made of clones introduced in England, from their original sources. Through the kindness of his daughters and his friends in England, all the introductions of the late George Yeld were obtained. All of Amos Perry's selections were collected. Many of the American introductions were purchased from the originators as well, and assembled in our garden. Today we have a collection of over three hundred and fifty varieties for breeding and testing. The Curator of the Royal Botanic Garden at Kew, England was considerate in supplying us with many items and from him we received *Fulva Rosea Rosalind* and *H. multiflora*. From the Royal Botanic Garden at Edinburgh, Scotland, we received the species *H. nana* and *H. Forrestii*. These have been especially valuable in our work. All these plants were tested and selected for breeding purposes.

We obtained a form of *H. fulva rosea* which we named *Fulva Rosea Pastelrose*. It is much more pink than *Rosalind* and without the deeper eye-zone. We were fortunate in purchasing deep red forms from a superintendent of an estate and this enabled us to make many crosses using reds for pollen parents. By persistently intercrossing reds and yellows we obtained fragrant deep red varieties.

All seedlings were started in the greenhouse for the first five years, giving blooms the second year, after which time only reds were used as seed parents. Each year seedlings not desired for further breeding were destroyed so that we would not have the urge to introduce clones before real progress had been made. Today we have a large number of seedlings to study.

Seedlings as well as new plantings of introductions of others, are grown at first in soil of poor plant food content that selections may be made for further study. After seedlings and named clones bloom the first time in poor soil, if worthy, they are moved to another garden with soil of good plant food content, where their real beauty can be realized and from this garden, when plants are thoroughly established, our descriptions are taken and introductions made. Temperatures here at Lawrence, Mass., range from twenty-eight degrees below zero to one hundred ten above in the sun. We have an excellent opportunity to test for hardiness and sun-resistant qualities. Some really fine clones recently introduced by others are not sufficiently hardy here.

Up to the present, we have introduced very few varieties, our first being in 1937, but beginning in 1941 we shall be ready for many releases.

We are particularly interested in red, lavender and pink varieties. The very full flowers are favorites with us. Fragrance in daylilies has been greatly stressed. It is our opinion that fragrant reds will be as prevalent as good fragrant yellows in time to come. We are greatly interested in flowers with decidedly green throats. We like those with the throat coloring reaching high up on the segments as well as keeping very low in the heart of the flower. Brighter lemon and yellow, mauve, raspberry, very bold reds with purple tones having soft cream to replace all the yellow are appreciated.

The writer, now in his late thirties, began daylily breeding in 1930. Professional photography is his occupation and always will be his work. To distribute adequately the daylilies originated he entered the commercial field under the name of "Craemore Daylily Gardens." Although any of the daylilies at Craemore are for sale, a specialty is made of "One Hundred of the Best Clones"—not by giving preference to his own, but by giving consideration to all. What he wants is good daylilies and not the glory of having introduced them. There are clones from nearly all prominent breeders in the selected-list.

The clones introduced by us are described elsewhere in this issue of HERBERTIA.

It is a pleasure to have had connections with Mr. Kelso and Prof. Graves who started the evaluation of daylilies. The latter was responsible for the planting, handy to us, of as many as three hundred varieties at the Mass. State College. We are appreciative of the work of The

American Amaryllis Society in recording daylily information. We are especially appreciative of the wonderful work of the late Mr. Yeld with daylilies at a time when results were very slow. His variety *Amber*, a very pale lemon, very full, with very heavy substance and of excellent fragrance is a monument to him. Of course we all know of Dr. Stout, who is responsible for our having the new species to revolutionize the daylily, and not forgetting Mr. Betscher, one of the pioneers to give us breeding stock.

Seedling Distribution. The distribution of daylily seedlings which are not worthy of naming and introduction, in our opinion, should be greatly discouraged in order that real progress will continue in daylily hybridizing. It is true that the breeder has numbers of very fine seedlings to discard each season. They are, however, inferior to the one selection made for introduction. The release of unnamed seedlings will spread daylilies generally more rapidly but it seems to us that the introduction of really fine varieties is much more important.

Another aspect to be considered concerns the breeder who sells his introductions. The caring for a field of sixty thousand seedlings for the period of time necessary for selection and reselection for introduction is costly. Out of a field of that number of seedlings possibly only a small number should be retained for further study and of this group only a few introduced. When large quantities of seedlings are grown to assure really fine forms, much help for their care is required. In turn the commercial breeder must realize sufficient income from his introductions to permit him to continue the work each year. Unnamed seedling distribution will decrease his sales.

That the progress in daylily hybridizing will not be retarded, making his business secure, we are certain that the breeder who has large quantities of unnamed seedlings will not distribute them, even though they are much better than those now generally in gardens. The hobbyist who does breeding should use great care to select only the very best of his seedlings, and to study large collections before introducing any and should destroy all others rather than to distribute them among friends. They might in time be named by others with too little knowledge of the new daylilies of today.

It takes quite a strong will to destroy large quantities of raspberry-colored seedlings, fine lavender-hued types and large, very fragrant deep red forms. However, there is great reward, if only the unusually outstanding seedlings are retained for further study and introduction.

MY INTEREST IN HEMEROCALLIS

M. B. MATALACK, *Virginia*

This interest in daylilies began when I first obtained a plant of *H. Middendorfi*. The color, habit of growth and time of blooming were so different from the only other daylily which I knew (*H. fulva*) that I was very much impressed. I then began to collect those which were within my financial reach. This was at about the time at which some

of Dr. Stout's newer creations were beginning to be released. Not being able to obtain the newer and finer breeding stock I commenced to make crosses among those at hand. I have been interested in working towards lightness in color, extension of time of bloom and of greater variation in color and form of early blooming varieties. As yet I do not feel that I have produced any plants which are sufficiently superior to those already on the market to warrant their introduction but I have had a lot of fun and still hope to obtain something of merit.

*2700 North 25th St.,
Arlington, Virginia.*

DAYLILIES IN JACKSONVILLE, FLORIDA

MRS. W. E. MACARTHUR, *Florida*

The daylily continues to interest the garden minded in this locality now that the daylily horizon has been broadened by the distinct new types and varieties of larger, more colorful hybrids that have extended the already long blooming season in Florida. The Camellia growers turn naturally to the daylily for spring and summer activity fascinated by the quick possibility of new creations all their own.

Mr. P. D. Shoemaker, of Jacksonville Landscape Co., has a fine collection of daylilies. One of his cherished, worthwhile seedlings has been named *Mary Grace*. Mr. Shoemaker recognizes the value of daylilies as landscape subjects and uses them copiously in parks, estates and small home plantings in this area. Mr. Ernest Sligh, of Slighs, Inc., has a very exclusive collection of all the finest varieties that have been released. By hybridization he has originated some very handsome new varieties, some of which have been named for his friends and customers. Junior Garden Club members are also experimenting in this fascinating work of daylily breeding.

Mrs. John H. Churchwell who excels in all phases of good gardening has perfected several vigorous bi-color seedlings of outstanding beauty. One gorgeous seedling has been named *Senator Fletcher*, in honor of the late Hon. Duncan U. Fletcher, United States Senator of Florida for many years.

The old-fashioned daylily has undergone a magical transformation in the hands of capable hybridists in these last swiftly passing years. Some have even been concentrating on more durable bloom, self-cleaning habit and the coveted shades of blue and white.

Floridians observe with pride the daylily breeding carried on at the University of Florida by Professor John V. Watkins with the cooperation of Dr. H. H. Hume. Some amazing new color combinations have been secured, one striking new seedling has been named *Mrs. John T. Tigert*, for the wife of the President of the University of Florida. This new clone has been released to the flower loving public by The Glen Saint Mary Nurseries, Glen Saint Mary, Florida, a firm that also introduced the twisted, lovely golden-petaled *Emily Hume*.

While daylilies are excellent in garden designing for reason of easy culture, freedom from the molestation of numerous garden pests, their greatest asset is their ability to give daily bloom all through our hot, dry or wet summers with a minimum of care. Last but not least they are being recognized and used in designing artistic arrangements for luncheons and teas.

PRELIMINARY REPORT ON TIME OF FLOWER FORMATION AND CHROMOSOME NUMBERS IN NERINE

W. M. JAMES¹ AND F. T. ADDICOTT²

The Genus *Nerine*, found only in South Africa, was first introduced to cultivation many years ago and has gradually become more and more popular, especially in England. In spite of being in cultivation so long, little is known of the details of its life history.

The species of this amaryllid genus may apparently be divided into two cultural groups—those that bloom before the foliage is produced and those with flowers contemporaneous with the foliage. The first group, including among others *N. sarniensis* and *N. humilis*, is found in the western part of South Africa where there is rainfall in the winter only. The other group, including *N. flexuosa*, *N. filifolia*, *N. Bowdeni* and others, is found in the eastern parts where there is rainfall in the summer only. These distinctions, however, must be accepted with reserve as there may be, in certain instances, a little overlapping. For example, there is *N. undulata* which comes from both summer and winter rainfall areas.

A collection of English hybrids and a few species growing at Las Positas Nursery gave an excellent opportunity to study reproduction and hybridization in this genus. It was found that some of the English hybrids failed to set seeds or cross with certain other hybrids or species. Some of the crosses made at Las Positas Nursery gave rise to apparently sterile plants. In his *Amaryllidaceae* (published in 1837), Herbert mentions sterility in certain crosses. This sterility unfortunately prevents recombination of certain desirable characteristics.

Because a knowledge of the chromosome numbers and morphology is an aid in determining relationships among species and hybrids of some genera, it was believed that a chromosome count of all the *Nerine* species available might show a reason for the sterility noted. There seems to be little literature on *Nerine* cytology. (HERBERTIA Vol. 4, 1937, pages 170-171). The report of Heitz (*Der Nachweis der Chromosomen* Zeit. Bot. 18: 625-681, 1926) was studied by the writers and it was found to be very limited.

Materials and Methods. It was anticipated that chromosome counts could be obtained from anther smears stained with Belling's aceto-

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carmine. The first few slides made showed that final reduction of the pollen grains takes place some time before the flower buds or umbel emerges from the bulb. Therefore it was found that it would be necessary to cut the bulbs in order to get anthers in the proper stage.

The supply of bulbs of most kinds was too small, and the bulbs were too expensive to cut. The quantity of *Nerine filifolia* was almost un-



Fig. 65. Dissected bulbs of *Nerine Bowdeni*, showing next year's inflorescence; X4. Photo by W. M. James.

limited, but these bulbs are small and difficult to handle, especially in exploratory work. A few bulbs of *N. Bowdeni* were cut, with surprising results.

The first bulb dissected was a very lucky choice. At the time of cutting, it had a fully developed flower stem, with about one-half of the flowers in the umbel fully open. Close to the outside of the bulb the

dry remains of last year's blossom stalk was found. About half-way in, on the opposite side of the bulb, was the flower stalk with the open flowers already mentioned. Farther in, just inside the scales with fully grown leaves on them, again on the other side, a very small inflorescence was found. This was quite far advanced but the perigone segments were not completely developed, and this would presumably produce next year's flowers. An anther smear showed that the pollen cells were probably resting before meiosis and had not yet made a final reduction. Two flowering bulbs were cut later with only the present year's flower stem being found. The bulb shown in the illustration (Figure 65) was dormant and had been out of the ground for about one month when examined. Not nearly enough bulbs were cut to determine the bulb structure with any accuracy. However, certain things were quite evident. The leaf arises from one-half, or one side only, of the circular scale or swollen leaf base of the bulb. The side from which the leaf arises is thicker than the other side. Six, seven or eight circular scales were found between each flower stalk. On each side of the flower stalk is a scale only part of the circumference in width; on the outside of the stalk it is about one-fourth of the circumference and on the inside about one-eighth. (See Figure 65.) It should be emphasized that these findings are only tentative and subject to revision if necessary in the light of further work.

Because of the time necessary in making slides by the paraffin method, temporary root tip smears were tried. Young main roots used before laterals started to develop and having slightly tapering, light yellow colored tips gave the best results. To start with, slides were made hourly during the day and night. This showed the greatest cell activity to be between the hours of 2 or 3 p. m. and 9 or 10 p. m. on clear warm days. Very little or no cell division was found when slides were made after a cloudy day. Following the preliminary trials, all slides were made between the hours of 5 p. m. and 10 p. m.

Sections were cut 50 microns in thickness with a straight razor and a hand microtome. The root tip was held in the microtome clamps between pieces of pith which had been cut from mustard stalks thoroughly soaked in water. Mustard pith was used because of its availability and because it was easy to find pieces with worm holes just the right size for the roots.

The sections stick to the knife and can be transferred with a needle to a slide with a drop or two of aceto-carmin stain. Four to ten sections were placed on one slide and then left in the stain from 5-10 minutes, or until they appeared darkly stained as seen through a hand lens.

The sections on the slide were then washed with a drop or two at a time of a solution composed of equal parts of hydrochloric acid and 95 per cent ethanol. This washing was continued for 5-10 minutes, or until the sections appeared to be destained sufficiently as seen through a hand lens. Some care must be used in this operation or the sections will wash off the slide.

The acid solution was then washed from the slide with 95 per cent ethanol. This operation moves the sections very little if it is done care-

fully and not too fast. Observation will soon show just how much washing is necessary to completely remove the acid solution from the slide.

Next a drop or two of stain is put on the closely grouped sections on the slide and a cover glass placed over them. After a minute or two the actual smearing was done by removing the surplus stain and flattening the sections between the cover glass and slide. Best results were obtained by placing a double thickness of soft writing paper over the

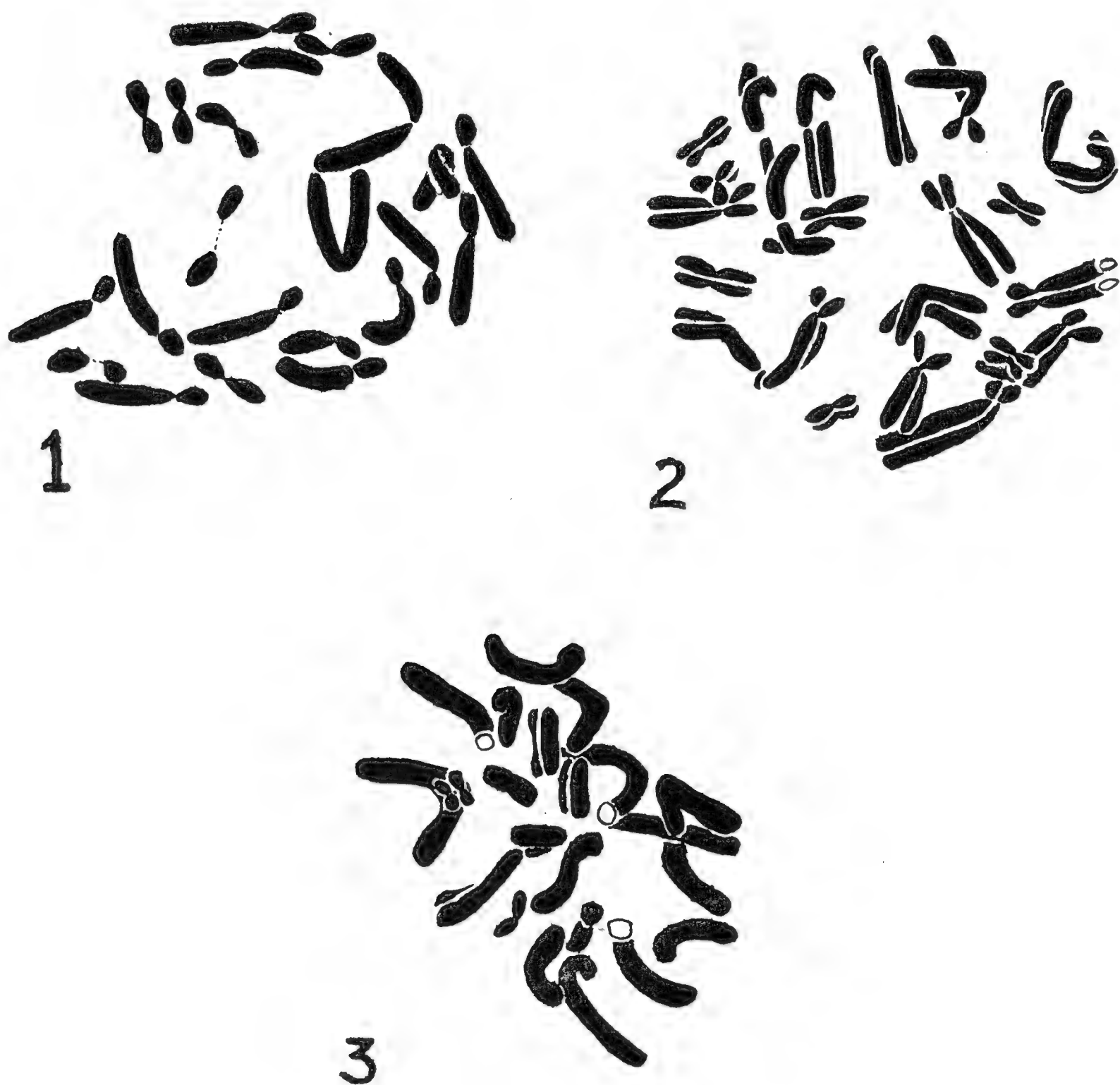


Fig. 66. Chromosomes of *Nerine* species; 1, *Nerine falcata*; 2, *N. Manselli*; 3, *N. coruscans major*; X1460.

entire slide, holding the paper very firmly on one end of the slide and then stroking the paper, over the cover glass, very gently toward the other end. If surplus stain is removed too rapidly, air bubbles are apt to form under the cover glass. The edges of the cover glass were then sealed by applying a mixture of paraffin and vaseline. Slides prepared in this way remained in good condition for several weeks. The chromosomes were stained by the time the cover glass was put on, but became darker and more distinct after a few hours. Chromosomes were counted with the aid of camera lucida sketches.

Results. Drawings of metaphase plates of the chromosomes of three species appear in Figure 66. These are all drawn to the same scale and indicate roughly the degree of variation of chromosome size within the genus *Nerine*. Within a species the chromosomes vary considerably in size as is usually the case in monocotyledons.

Table I shows the results of studies of six *Nerine* species and horticultural clones that were available. These counts are not to be considered final. It is intended to expand the list and check it carefully by a different method as time permits. The table does show several points of interest:

(1) The work of Heitz (quoted above), concerning *N. Sarniensis* and *N. curvifolia*, is corroborated. He reported the following haploid numbers: *N. sarniensis*, 11 -(12); *N. curvifolia*, 11 -(12); *N. undulata*, 11; *N. pusilla*, ca. 12.

(2) The chromosome numbers within the genus appear to be, however, somewhat more variable than Heitz' work suggested. If the hybrid horticultural clones are included, there are probably at least four different diploid numbers. The numbers 22, 24 and 28 seem fairly certain with a fourth number in the low 30's.

TABLE I
Chromosome numbers of six Nerine species and five horticultural clones

<i>Species of hybrids</i>	<i>Diploid chromosome number</i>
<i>Nerine flexuosa</i> var. <i>alba</i>	22
<i>Nerine sarniensis</i> var. <i>coruscans major</i>	22
<i>Nerine Bowdeni</i>	22 (-23?)
<i>Nerine falcata</i>	22 (-23?)
<i>Nerine curvifolia</i> var. <i>Fothergilli major</i>	24
<i>Nerine filifolia</i>	24
Hybrid <i>Nerine</i> hort. clone <i>Chameleon</i>	22 (?)
Hybrid <i>Nerine</i> hort. clone <i>Manselli</i>	24
Hybrid <i>Nerine</i> hort. clone <i>Elegantissima</i>	28
Hybrid <i>Nerine</i> hort. clone <i>Mrs. George Barr</i>	28
Hybrid <i>Nerine</i> hort. clone <i>Ingens</i>	32 (-34?)

(3) Examination of these preliminary counts alone indicates no simple explanation of the relationships among the species within the genus, and of their breeding behavior.

It should be noted that the chromosome morphology varies from species to species. That is, certain chromosome shapes may appear in some species but not in others. Time has not permitted more than a few observations of this phenomenon. But some rather unusual shapes have been noted. In *N. Bowdeni* was observed what appeared to be a very large satellite. The satellite itself appeared to be as wide as the chromosome proper and was 2 to 3 times the thickness of the chromo-

some in length. It was attached by a fine thread of about the same length as the satellite. There was only one of these chromosomes to be found in any of the cells observed. *N. falcata* showed a pair of small V-shaped chromosomes whose arms were separated by a slender thread about the length of each arm (see figure).

Conclusions. In conclusion it appears that the work to date has raised more problems than it has solved. For example *N. Bowdeni* mentioned above is supposed to be a good species. Why then should at least one chromosome be found without a homologous mate? It is the opinion of the writers that this and other questions concerning the cytology, taxonomy and genetics of the species of *Nerine* can not be approached until the chromosome types of each species are known and identified. This work has been started and will advance as rapidly as regular duties will allow.

NOTES ON NARCISSUS BREEDING AND CULTURE

L. S. HANNIBAL, *California*

Throughout most of the temperate parts of the earth narcissi rank in or near first place with reference to early spring flowers, for they are equally suitable—either as a cut flower for indoor use, or a foreground border or bedding plant in almost any type of outdoor garden. Old records show that the species were in some use back in the early Roman time, and at present their widespread cultivation is a unanimous proof of their ever increasing popularity. Unfortunately this best known genus of the Amaryllidaceae has not received the full attention in *Herbertia* that it is undoubtedly entitled to. The following information is presented for the benefit of those who desire to try their hand at *Narcissus* breeding and culture on a small scale. The lack of practical data has apparently kept many amateurs from attaining results with one of our finest plant subjects that actually presents many unique and interesting possibilities—A truly fascinating field of work for those few who are actively engaged in it.

In general one has a wide range of *Narcissus* species and hybrids from which to select, far greater than one ordinarily suspects.¹ Records show that there are some 8000 named horticultural clones with many new ones added each year. No person can be expected to know more than a limited number of popular clones from any group, nor can one expect all to thrive under identical conditions. *Narcissus* species come from a number of different climatic and environmental areas extending from northern Europe and Spain to China. Normally the trumpet classes from northern Europe desire a cool, moist winter climate while the polyanthus types do better in dryer regions of limited rainfall and light frosts, or no frost at all. In most cases hybrids for several generations retain the desire for the general climatic requirements that their ancestors were adapted to, most types requiring dry or near dry summers, though there are exceptions—notably the Jonquil, or a few *N. tazetta*

varieties and their hybrids, that may be adapted to citrus areas subject to heavy summer rainfall.

With these facts in mind one should select rather than be a collector of species and horticultural clones. In the northern areas of heavy winter rains and frosts choose the hardy daffodils; the Poetaz and Tazetta types should be avoided as they freeze easily. In central and southern California Yellow Trumpets, Incomparabilis, Leedsii, Cyclamineus, and Tazetta hybrids all do well. Barrii, Triandrus, and Jonquil, which require more moisture, often give some difficulty unless one is equipped to cope with their special requirements.² The types that can be grown in Florida³ owing to the heavy summer rainfall have been limited essentially to the Polyanthus and Jonquil types; however, new material consisting of hybrids having parentage of the Southern Chinese *N. tazetta* species give promise of new possibilities, and eventually will find wide spread use in many semi-tropical areas.

Narcissus do best in a light garden soil, but they are also adaptable to other soils including heavy calcareous clays. A mulching of the soil is not considered essential, but is of benefit for choice specimens when fine blooms are desired. Suitable deep mulching can best be done while the bed is in preparation for planting by working ample manure into the soil down to a depth of 18 inches. This is especially desirable for the Jonquils.

In the moist areas of the Pacific coast a planting depth of 6 inches in sandy soil, and 4 to 5 inches in heavier loams is standard. However, as one moves inland or south into the drier summer areas, deeper planting is advisable, primarily to conserve moisture about the bulb, but likewise to keep the bulb cooler during the hot summer days. A depth of 12 inches may sound excessive, but it has been found very satisfactory in exposed areas where summer moisture is limited, especially if the ground bakes excessively under the hot sun. In warm areas of summer rainfall shallow plantings apparently are advisable. We understand that Mr. Hayward suggests 2 inches in central Florida.

One point of interest when shallow planting is practiced in central or southern California, but apparently of little importance along the Atlantic Coast, is the tendency of the bulb to multiply rapidly. This is not only experienced with Narcissi but also with tulips, and to a certain extent with hybrid *Amaryllis*. The abnormally dry conditions which the bulbs are subjected to during their summer's rest definitely contributes to this behavior, which can easily be overcome by deeper planting.

As mentioned above many new hybrids are being introduced each year. Unfortunately it takes many years for the best types to reach a price range which is within the reach of the person with the average sized pocketbook. For that reason one seldom sees the newer types in the home garden. They are usually confined to the large estates or to choice private collections. A visit to one of these collections is always of interest, but the real opportunity is to visit the gardens of those who are actively engaged in *Narcissus* breeding such as that of S. B. Mitchell in Berkeley, or K. L. Reynolds in Pasadena. The color compositions, size, texture, and number of new types with their extreme variety of

form far exceed ones expectations and unfortunately can not be described here in detail. With the breeding activities of the last 20 years great improvements have been made, for comparatively speaking the 50 year old *King Alfred* or *Sir Watkins* cannot hold first place for show purposes in a garden containing the newer types. The new color developments are partly responsible for this. Perianths may vary from pure white to cream or deep yellow while the cups ever extend into the deep orange-red for some types; *Francisca Drake* being one of the striking examples where an apricot red cup is backed by a large white perianth. Size is another character of interest—a number of the trumpets and Incomparabilis type have a perianth often 4 to 5 inches in diameter and grow well above the foliage on strong sturdy scapes in a manner that immediately attracts attention. This is under normal outdoor garden conditions; larger flowers can be obtained by forcing. This also applies to clones of the Leedsii group.

With a number of people, to whom size is not so essential, the Triandrus hybrids offer several medium to small sized forms which cannot be excelled, and there are also the true miniatures suitable for rock garden use. The species *N. canaliculatus*, a dwarf China Lily, and *N. bulbocodium conspicuus*, the "Hoop Petticoat" daffodil, are the two best known of a group of dwarf species. A number of dwarf hybrids have been produced and are sure to become more popular as time goes on.

In regard to breeding, many of the newer hybrids may be unavailable, particularly due to high prices, but a large number of clones are not advisable since they are often partially or almost completely sterile, or they may be sterile in certain areas due to adverse climatic conditions. As one gains experience in breeding, these newer types can be tried in different combinations, but if a hybrid is reported as near sterile one can expect it to have viable pollen only under the best of climatic conditions. The history of Buttonhole⁴ is a good illustration.

For the beginner there are a number of older clones that have good possibilities when used in certain combinations, especially when crossed back on *Narcissus* species such as *N. triandrus*. A surprising number of the recent new clones have been obtained in this manner. Mr. S. B. Mitchell in his popular garden book, *From a Sunset Garden*, lists some 20 daffodils by name, all of which are good seed parents and can be used in a number of ways. This list includes,—*Bernardino*, *Cleopatra*, *Great Warley*, *King Alfred*, *Lord Kitchener*, *Mme. de Graaff*, *Mrs. Krelage*, *Monarch*, *Beersheba*, *John Evelyn*, *Mityline*, *Naxos*, *Sun Star*, *Beacon*, *Fortune*, and others.

The following suggestions are given in brief as a possible outline for experimental breeding:

Some Jonquilla hybrids are slightly fertile—i.e., partly viable pollen can be had from *Lady Hillingdon*. The species offer good hybridizing possibilities. In warm dry areas the seedlings may be sensitive to stripe. Poetaz hybrids are sterile due to an odd chromosome complement—an exception is *Fortune* where the pollen can be used under ideal conditions. Triandrus species such as *N. triandrus* var. *alba* will often take *N. tazetta* pollen, such as *Paper White*, and give rise to a number of interesting

plants. The reverse cross of *N. triandrus* pollen on *N. tazetta* will not take since the latter has a higher chromosome complement.⁵

Triandrus alba on Trumpet or Leedsii clones will often give a pendant flower type of unusual interest. *N. triandrus calathinus* on any good daffodil will give good results—many of the seedlings may resemble *Silver Chimes*. If used on a Leedsii, a *Thalia* type is often obtained. The cross of *N. triandrus calathinus* on “*Grand Monarch*” gave rise to seedlings similar to *Silver Chimes*, which is one of the most outstanding white Polyanthus hybrids recently produced. *N. triandrus calathina* on *N. triandrus concolor* will give attractive plants with good pollen. If the former is used on some of the pink Trumpet daffodils, such as the *Mrs. R. O. Backhouse* type, pink types are often obtained. *Mrs. R. O. Backhouse* itself takes pollen poorly. *Jonquilla simplex*, and the dwarf *Jonquilla*, cross both ways with *N. cyclamineus* giving rise to a variety of seedlings, a number of which have a long flowering period. Most *Incomparabilis* make good breeding stock. Many *Narcissus* hybrids are not self-fertile. Emperor is an exception.

Concerning the methods of hybridizing: With most *Narcissus* the stigma of the flower to be treated is in the receptive condition for pollen during the third day of blooming. An anther obtained from the pollen parent is brushed lightly over the end of the stigma. The best success is obtained during warm (50° to 60°F) dry days. Damp, humid conditions tend to make the pollen deteriorate rapidly. Pollen can be stored under dry conditions in a desiccator for a month or more. The seed ripens in 6 to 9 weeks and for best results should be planted while still fresh. A good sandy garden loam enriched with bonemeal can be used, and normally the seeds are planted an inch deep. The bed should be partly shaded and remain slightly moist, but not too damp until growth starts during the following winter. Uniform moisture should then be provided until late May or June, when the foliage dies back. Flowers cannot be expected within 4 years and they often take 6 or 7 years.

We have heard much regarding chromosome doubling. Daffodils present cases where this had occurred in nature. *King Alfred* possesses a double chromosome complement of $4n=28$. A number of other Trumpets also have this condition, including “*Tunis*” which is a seedling of *King Alfred*. Seedlings from these parents possess a vigor and hardiness which makes them highly desirable, and they are used frequently in breeding work. In fact, among the *Narcissus* species and hybrids one finds various chromosome complements which present numerous interesting possibilities to those who undertake advanced *Narcissus* breeding.

Sports are not uncommon among the *Narcissus*—several forms have been reported in literature.⁴ Mr. Hornbeck of the Oregon Bulb Farms recently reported a double found in a block of *John Evelyn* which has excellent promise.⁷ The writer had several double sports called to his attention in a nearby garden where daffodils are raised for the cut flower trade. Only this spring the writer had the occasion to note that several bulbs in an established clump of *Sir Wakens* had produced flowers having eight petals and an ovary of four sections. These bulbs were in a

relatively cool location. Apparently the botanists are correct when they say that the *Narcisseae* are a late development. We can expect some interesting results in the years to come, not only from cross breeding, but by watching for sports also. Why not join the fun?

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MRS. ROWNTREE ON CALIFORNIAN AND MEXICAN
WILD FLOWERS

Mrs. Lester Rowntree of Carmel, California, who contributes the excellent article on *Hesperocallis undulata* in this issue of *Herbertia*, is rendering a very valuable service in popularizing Californian and Mexican wild flowers. Mrs. Rowntree is author and publisher of the delightful book, "Flowering Shrubs of California and their value to the Gardener." This work has been enthusiastically welcomed by gardeners generally. Mrs. Rowntree is also to be congratulated for her inspiring "Talks on Californian and Mexican Wild Flowers". These talks are illustrated with excellent colored slides, and will be given according to the following approximate schedule, spring-autumn, 1942:

Southern States: Southwest—March

Southeast—November

Central States:—late April and May; early June

Eastern States:—Late June to early November

Interested persons and organizations should communicate directly with Mrs. Rowntree.

—HAMILTON P. TRAUB

5. PHYSIOLOGY OF REPRODUCTION

SOME EXPERIENCES IN DAYLILY PROPAGATION

J. S. COOLEY, *Maryland*

At this time of rapidly expanding interest in daylilies, many growers are anxious to know how to obtain rapid increase from a limited stock of varieties that are difficult to propagate. The rampant spreading clones, as *Hemerocallis Fulva Europa*, that become objectionable because of rapid vegetative reproduction are not concerned in this discussion. We want to know the conditions most favorable for natural increase and also the time to divide the clumps so as to cause the least disturbance to their growth and consequently to promote the maximum increase.

The rate of reproduction of several varieties of daylilies has been observed when growing under adversity, such as low moisture and food on account of tree roots, in contrast with plants in fertile and well-cultivated soil. The rate of increase was much more rapid where the plants were given conditions approaching the optimum for growth than where moisture and food were decidedly insufficient. It would be interesting to carry out controlled experiments to determine the influence of soil condition on rapidity of rhizome production.

Concerning the proper time to divide clumps, the usual advice is to divide them any time. This has been contrary to the experience of the writer when growing daylilies in a silty soil having an impervious subsoil or hardpan several feet from the surface and where the soil is consequently sometimes too wet. Dividing soon after blooming is completed has given good results in most seasons. Root activity was less at this time than at any other time when examinations were made. If dividing is done in a period of low root activity and just prior to a period of rapid root growth, one would expect much better results than when the plants are disturbed in the midst of or toward the end of their active root growth. According to the observations of the writer, working in the vicinity of Washington, D. C., there is a period of rapid root activity in the spring and again in the fall with more or less lull between these two periods. The shock to the plant resulting from disturbing when it is in full leaf is sometimes very severe.

Dividing in late fall or even transplanting where all the soil is removed has given bad results under certain conditions. It is now known that in certain plants, such as apple trees, wounding just prior to severe cold, may increase susceptibility to cold-injury. A similar situation seems to obtain in case of the daylily. Cold-injury to the crown has been much more prevalent on disturbed or damaged plants than on those having become well established by reason of dividing before the advent of cold weather. Sometimes late transplanted or late divided plants have died outright, apparently from cold-injury, and other clones under other conditions become stunted resembling plants with virus disease. The leaves are short and crinkled and growth very poor with no bloom on the affected shoots. Such plants struggle through the summer following

the injury but recover by the next year. The evidence at hand indicates that this stunted condition is not due to a disease organism but to cold injury at the crown. Similar response has been noted where otherwise undisturbed clumps have been injured by tramping during the winter.

EASY GERMINATION OF SEEDS OF AMARYLLIDACEAE IN SPHAGNUM MOSS

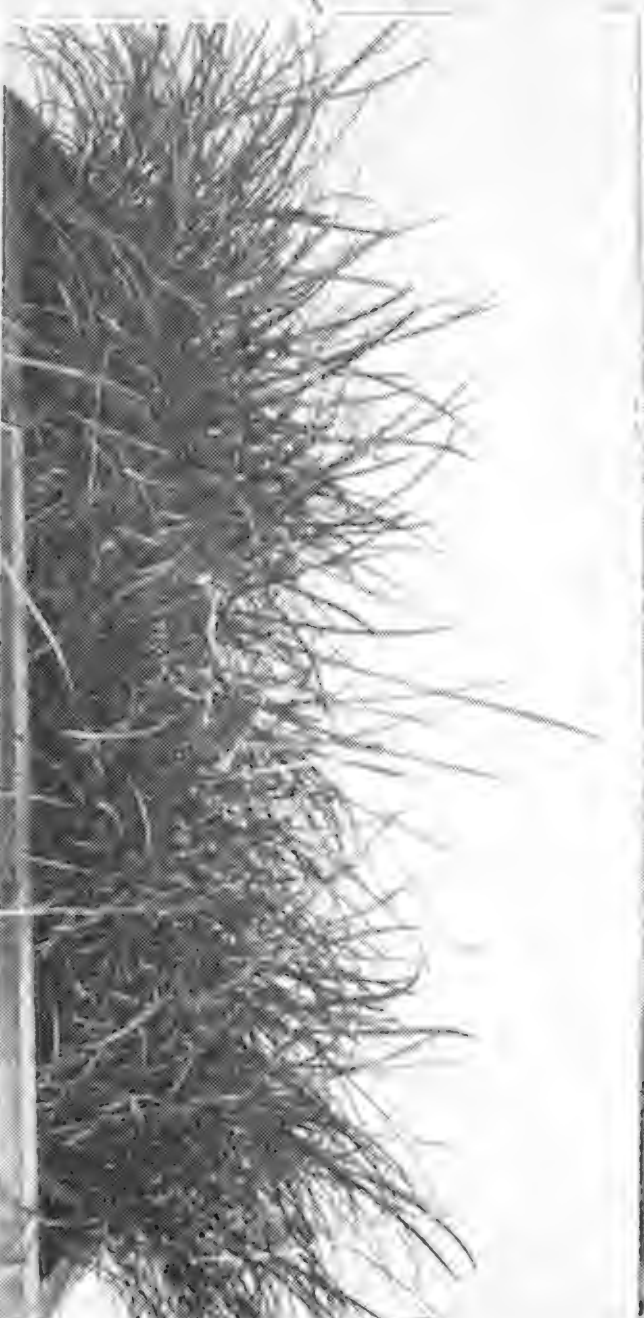
ALBERT W. CLOSE, *U. S. Plant Introduction Garden,
Glenn Dale, Maryland*

The use of sphagnum moss as a seeding medium is not a new technique but has not received the attention it deserves. The author (2) and co-workers (6) have recently called attention to its value and have given directions for practical use. Sphagnum moss has been used almost exclusively for indoor seed germination at the U. S. Plant Introduction Garden, Glenn Dale, Maryland for a period of over 15 years. Few references to the use of sphagnum moss may be found in the literature although Burbidge (1) Hatfield (5) and Craig (3) recognized its value as an aid to germination. Morrison (4) has advocated the use of dried sphagnum to cover seed of azaleas sown in seed flats of compost.

The sphagnum seeding method prevents the development of damping-off troubles. Sphagnum is easily prepared, requires no sterilization before using, and its use eliminates the need for subsequent chemical treatments. Plants grown in sphagnum are removed easily for potting without loss of roots. Another advantage in its use is the easy regulation of growth, since seedlings may often be kept on in good condition for long periods of time while needing almost no attention if feeding with nutrients is withheld. The method requires a minimum of attention and if a suitable covering is provided, the seeds will usually have germinated before a second watering becomes necessary.

Living sphagnum has been used for seed germination in much of our work since it is available locally. However, the dry baled sphagnum, which is available to all at a reasonable cost, is as satisfactory. The preparation of the medium is simple. A hammer mill is useful for shredding large quantities, but to provide the small amounts ordinarily needed, the sphagnum may be rubbed through a hardware cloth sieve having three meshes per inch. The dry sphagnum may be kept ready for instant use for a long time after preparation.

Seed flats should be prepared with a moisture-retaining substrate, such as soil or preferably peat and sand. A layer about an inch and a quarter thick of the shredded sphagnum is placed loosely over the substrate in the flat and after it is levelled it is firmed to three fourths inch. An air space of one-half inch should be left between the top of the flat and the surface of the moss. Then the flats may be watered, preferably before the seed is sown, watering twice if necessary. Since there is no



UPPER LEFT, *Manfreda* sp. (thicker stand, right); *Praedranassa carmioli* (thinner stand, left); seeds sown 4-15-41 on living sphagnum, photo 11-3-41; UPPER RIGHT, *Hermannthus Katherinae*, also 2 plants of *H. albiflorus*, left; seeds sown 2-12-41 on dried sphagnum; photo 10-3-41; LOWER LEFT, *Cyperanthus angustifolia* (right), *Cyperanthus* sp. (left); LOWER RIGHT, *Cyperanthus* sp.; seeds sown on dried sphagnum, 2-12-41, photo 10-3-41.
Plate 213

danger of excess moisture if the drainage is adequate, watering should be ample. Although not necessary, the use of mineral nutrient solutions hastens the development of the plants. A solution of one tea-spoonful each of potassium nitrate and commercial superphosphate per gallon is satisfactory, and may be applied freely before seeding. Additional applications may also be made after germination. The flats should stand for an hour or more before sowing, in order to give the moss surface time to become springy and porous and to form small cavities into which the seed may settle.

After the seed is sown the flats should be covered with a pane of glass or a light wooden frame covered with a glass substitute. Suitable shading should be provided. When germination is complete, the cover should be raised slightly to permit surface aeration. When the plants have hardened, the covers can be removed completely.

Tests with this method, placing the sphagnum layer on the soil in an outdoor sash-covered frame demonstrated that the use of this method is not limited to the greenhouse (6).

A conspicuous feature of the use of sphagnum is the virtually complete freedom from damping-off which is secured. One of the advantages of sphagnum over steamed soil is that the danger of accidental infection is eliminated. Intentional inoculation with fungi may kill a few seedlings in localized areas, but the fungus does not spread as it would in soil.

Among the genera so germinated at the U. S. Plant Introduction Garden include *Agave*, *Ammocharis*, *Bomarea*, *Cooperia*, *Cyrtanthus*, *Habranthus*, *Haemanthus*, *Manfreda*, *Nerine*, *Phaedranassa*, and *Zephyranthes* (See Plate 213). Those familiar with the germination behavior of these seeds will know that no particular problems are involved. It is doubtful if better stands will be obtained by the use of sphagnum. However the method has the advantage of convenience in the early care of the seed flat, and if seedlings are to be transplanted while very young, the process may be facilitated by the use of sphagnum.

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6. AMARYLLID CULTURE

REGIONAL ADAPTATION, SOILS, FERTILIZATION, IRRIGATION,
USE IN LANDSCAPE, DISEASE AND INSECT CONTROL, ETC.

DAYLILIES IN CALIFORNIA

DONALD B. MILLIKEN, *California*

The Editor and Secretary have asked me to write on the subject of *Hemerocallis* in California. I am willing to give my views based upon my own experience and observations but they will not be premised on a comprehensive survey of daylily plantings throughout the entire state. Such a survey would require much time and travel for California is a large state, there are in it many gardens, and growing conditions are diverse.

I know that *hemerocallis* thrive under most California conditions. They seem to enjoy the dry air of our inland valleys and they flourish along our beaches and coastal plains. My Arizona friends tell me that daylilies grow exceptionally well under the extremely arid conditions of their mesas. *Hemerocallis* and iris without question are plants which are adaptable to a very wide range of climates, soils, temperatures, and available moisture supplies.

Still daylilies are not yet as generally used in California gardens as one might expect. This I think, is due to the fact that only a few of the older named sorts are generally known and these have not caught the imagination because their differences are not sufficiently pronounced. So soon as it becomes generally recognized that our hybridists, led by Dr. Stout, have now made available in these hardy plants a wide diversity in color, size, height, shape and time of flowering, there certainly will be much more extensive use of daylilies in our California gardens.

California gardeners will wish evergreen foliage when this can be secured without too great a sacrifice of other characteristics. Very likely some clones which do not thrive in the northern and central states may find a welcome home here. However, it will always be possible, as Prof. Watkins suggests, to use deciduous daylilies without leaving large bare spots in the winter garden by grouping them with some of the evergreen types.

I am convinced that daylilies should and will come into a much larger use in the future than they have had in the past. Milliken Gardens is going to try to do its part in bringing to the attention of its friends both in California and elsewhere, whom it has been supplying with iris for many years, that this sturdy plant, the daylily, while perhaps not exhibiting quite the wide range of colors found in iris, is no longer what many people think it to be. That it is not always yellow or tawny red, that a man by the name of Stout has stirred things up, that other able workers have taken hold and helped and that if they think that a daylily is always yellow or tawny that then they have a surprise coming.

At Milliken Gardens we shall be interested to get acquainted with the new releases of Dr. Stout as they are made by the Farr Nurseries under the able and conservative management of Mr. Seyler, to keep track of the work of the Sasses, Mrs. Nesmith, Mr. Claar and others working in the North but we shall also be watching with keen interest the selections coming from Dr. Traub, Mr. Hayward, Prof. Watkins, Mr. Wheeler, and others who are working in the South in an environment similar in its mildness to California. From them California will be expecting beautiful specimens with evergreen foliage, rich clear colors which do not fade in our bright sunshine, and dwarfs which will be charming in flower arrangements as well as in the garden. Finally whether from the North or South, East or West, whether deciduous or evergreen, we shall be looking for that white daylily, of splendid form and texture, borne on tall, well-branched scapes. Then when we are asked for a lily which will grow in the sun or in partial shade, in rich soil or soil which is slightly alkaline, in heavy soil or light, in dry or in wet places, we shall have the answer.

There is no valid reason why California should not keep up with the procession in the appreciation of the new daylilies. As far as the suitability of her environment is concerned she should be helping to lead. It is an embarrassing thing for a Californian to admit but apparently many of its residents have an educational deficiency. *We shall have to start doing something about it.*

INITIATION OF INFLORESCENCE IN DAYLILIES

J. MARION SHULL, *Maryland*

Curiosity as to time of blossom bud formation in the daylilies led to the dissection of a number of crowns and a general study of their natural manner of increase and of scape production. There are peculiarities of behavior that make such study a bit difficult.

In HERBERTIA for 1939, pp 184-187, Grainger, writing of *Amaryllis*, presents diagram and text indicating that in *Amaryllis* hybrida an inflorescence is set off for each successive four leaves produced. And in Araceae, growth is generally on a sympodial plan, a scheme wherein a definite number of leaves are followed by a scape even if, as in the Skunk cabbage, some of the buds so set off have to be aborted, sacrificed by blighting, either for seasonal reasons or to reduce the strain of fruit and seed production to the capacity of the foliage to support and mature such fruit.

It was thought that perhaps the *Hemerocallis* followed the same procedure, but this does not appear to be the case. The *Hemerocallis* does evidently convert its terminal bud into an inflorescence just as in the above, and as in the genus *Iris*, but this is probably done either on a seasonal basis, as a result of accumulating energy, or as determined by a definite status of maturity, and not on the purely mechanical basis of the number of leaves as in normal sympodial growth.

While it has not been possible as yet to carry this study to completion, to determine with certainty just when blossom buds are laid down in a number of standard varieties, one may hazard a tentative statement based on results to date. In general it would seem that the early varieties, due to bloom in April or early May in the latitude of Washington, D. C., lay down their blossom buds before winter sets in and lie over in this condition ready to jump into action at the first stirring of spring. However, in one early variety, *Aureole*, no such buds were found in October though the crowns seemed sufficiently well developed to warrant expectation of bloom in 1942.

No dissection of known late bloomers disclosed blossom buds at this time. Whether or not blossom bud formation goes on even during the otherwise dormant condition of these later flowering sorts, or whether they are formed during the early growth of spring, will have to remain for further investigation.

Results of this study up to the present time are shown visually in Plate 214. The following legends, *A* to *H*, inclusive, refer to the figures in Plate 214.

A, *Hemerocallis minor* as of October 28, 1941. Plant was flaccid and foliage nearly spent. One-half natural size. Flower scape for next year's bloom and renewal bud, at left, five times natural size.

B, *Hemerocallis flava*, October 28, 1941. Green leaves, dead scape, and lateral bud, one-half natural size. At right, flower scape and renewal bud five times natural size.

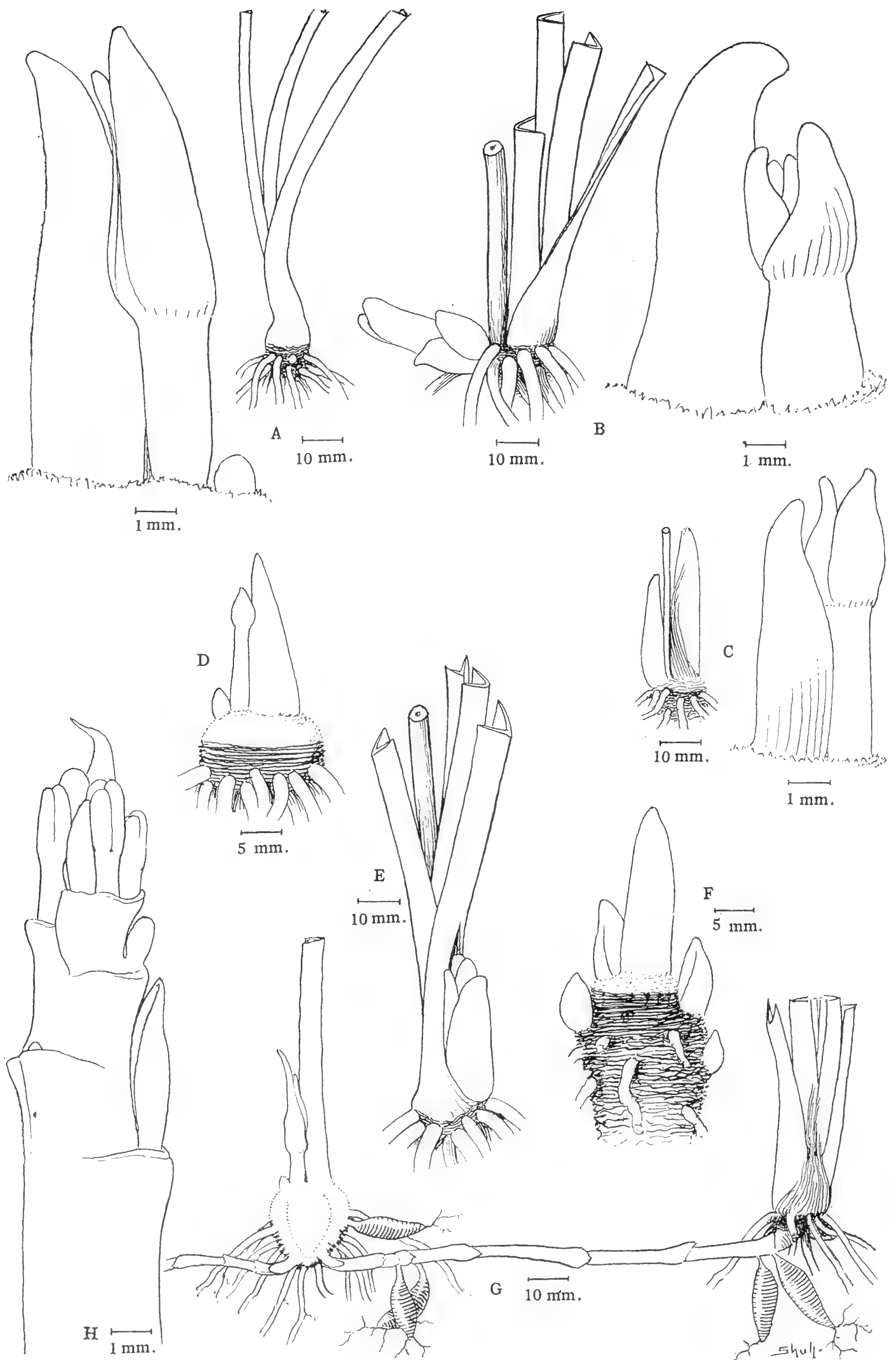
C, *Hemerocallis* clone *Dr. Regel*, October 28, 1941. Plant completely dormant for approaching winter. Large bud at right of dead scape contains both blossom bud and new terminal or renewal bud. At left of the scape is a smaller lateral bud comparable with the heavy horizontal bud in *B*. One-half natural size. Flower scape and renewal bud, at right, five times natural size.

D, *Hemerocallis Middendorffii*, October 7, 1941. Plant completely dormant. Scape between renewal bud at right and first lateral bud at left. Natural size.

E, *Hemerocallis*, clone *Calypso* as of October 27, 1941. Appearance is deceptive. The large bud is terminal and originated in the axil of the leaf nearest the scape to the right. Swelling of the bud has caused it to erupt through the bases of all three leaves so that it seems to stand behind them. Although this bud was probably destined to bloom the following season there was still no evidence of an inflorescence at the above date. Old scape, and a small lateral bud not shown, are just inside the leaf at left. One-half natural size.

F, *Hemerocallis*, clone E-15(Shull) as of October 18, 1941. This strong crown, presumably destined to bloom in 1942, as yet shows no evidence of bloom for the coming year. It is presented here for contrast with *G* as illustrative of clump habit.

There are present a well developed terminal bud and four laterals of progressively decreasing size. Theoretically there is a bud, or the possibility of bud development, in every leaf axil, but in accordance with



Time of flower bud initiation in Hemerocallis. For further details see text.

a plant's needs many of these remain dormant or as mere potentialities that are only called into activity in case of emergency. Each of these lateral buds that develop sets out on a terminal growth of its own and gradually builds the rather dense clumps that are characteristic of our most acceptable garden varieties. Natural size.

G, *Hemerocallis*, clone C-2(Shull) X *Vulcan*, an unbloomed seedling as of October 29, 1941, at 18 months from seed. Twenty-one leaves were dissected off to expose the flower scape prepared for next season's bloom. Date of normal bloom is of course not known but parentage would indicate late June to early July in the latitude of Washington, D. C.

Here the entire growth from seed to the formation of a crown is seen and quite early in its development two underground stems or rootstocks have been given off in opposite directions thus marking it as a spreader or of the running type as distinguished from the clump type shown in *F*. Center (original seedling) plant carried twenty-two leaves; offshoot at right had fourteen and at left eight. One-half natural size.

H. Inflorescence from *G* further dissected by removal of three scales to disclose individual flower buds as well as less developed nascent branches. Five times natural size.

FLOWERING SEQUENCE OF DAYLILIES IN FLORIDA

JOHN V. WATKINS,

Assistant Professor, Horticulture, University of Florida

During the past eight years data have been carefully recorded for the genesis, climax and cessation of flowering of the species, the commercial varieties and the seedlings that are growing in the Daylily Display Garden on the campus of the University of Florida. There has been a marked annual fluctuation in the dates during the time that these records have been kept. Experienced gardeners know that minimum temperatures, precipitation, humidity and other factors have a very great influence upon anthesis, hence it is futile to suggest that calendar dates might mark the consistent blossoming of any given daylilies. The positions within the monthly columns in Plate 215 are arbitrary, therefore, and although they cannot be considered as accurate to the day, they are quite typical for normal years as indicated by the data at hand. It is hoped that this chart will be helpful to those gardeners who plan to acquire new daylilies.

The figure was designed with pointed ends to represent the beginning and ending, while the domed center is to depict the climax of flowering. Although anthesis is here portrayed as being about a month in duration, there is varietal deviation from this arbitrary period and it is merely an approximation. Well fed, long established clumps have extensive root systems and will flower over a longer period than will separate ramets that have not become settled.

A glance at the chart will show that most of the very early sorts bear blossoms of yellow or orange while most of the reds, purples and

MARCH	APRIL	MAY	JUNE
.....AUREOLE.....			
.....SEMPERFLORENS.....			
.....DOMESTICO.....			
.....GOLD DUST.....			
.....ORANGE MAN.....			
.....WESTMERE.....			
.....H. MIDDENDORF.....			
.....H. MINOR.....			
.....PALE MOON.....			
.....SIRIUS.....			
.....WAUBUN.....			
.....EUROPA.....			
.....MRS. J. J. TIGERT.....			
.....MIKADO.....			
.....PARTHENOPE.....			
.....PATRICIA.....			
.....BAGDAD.....			
.....FLORHAM.....			
.....EMILY HUME.....			
.....VULCAN.....			
.....H. AURANTIACA.....			
.....DAUNTLESS.....			
.....MRS. A. H. AUSTIN.....			
.....E. A. BOWLES.....			
.....SWAN.....			
.....THE GEM.....			
.....CHISCA.....			
.....BIJOU.....			
.....GOLCONDA.....			
.....GOLDEN BELL.....			
.....OPHIR.....			
.....SIR MICHAEL FOSTER.....			
.....THERON.....			
.....HYPERION.....			
.....CYPRIANA.....			
.....MACULATA.....			
.....ROSALIND.....			
.....H. SEROTINA.....			

FLOWERING
SEQUENCE OF
CERTAIN DAYLILIES
IN THE DISPLAY GARDEN
AT THE UNIVERSITY OF
FLORIDA

John V. Watkins, del

| MARCH | APRIL | MAY | JUNE |

Plate 215

bi-colors fall into the already overcrowded midseason group. Southern hybridizers will do well to point some effort toward the creation of heavily pigmented seedlings that will flower in February and March.

Clones, such as *Gold Dust* and *Sovereign*, derived from the class Dihemera¹ are deciduous, they have notoriously short periods of bloom, and they often produce scapes so short that the blossoms are borne just at the surface of the ground. These clones, although excellent for northern gardens are not recommended for peninsular Florida. On the other hand, such excellent evergreen varieties as *Aureole*, *Domestico*, *Emily Hume*, *Semperflorens* and *Wau-Bun* bloom early and may be showy for as long as two full months.

Many clones have a short second flowering period but the blossoms are likely to be smaller and much paler. In Florida, the mid-summer sun injures the dark pigments as it bakes through the tissues of the unopened buds, and it is essential therefore, that varieties with pink, red or purple pigments be evaluated before the middle of May.

It is interesting to compare Plate 215 with Figure 57 presented by Miss Kojan² in this publication in 1940. Clones that appear in both charts hold approximately the same positions, the only outstanding difference being that the Florida dates precede those of New York by two months.

THE VARIEGATED DAYLILY IN FLORIDA

JOHN V. WATKINS,

Assistant Professor, Horticulture, University of Florida

In 1939 several divisions of the variegated Daylily, *Hemerocallis fulva* clone *Kwanso Variegatus*, were received from a grower in New England. In their permanent places in the University's Daylily Display Garden, these plants have succeeded in northern Florida. Known to horticulture for many years, the plant is to be found in gardens of both hemispheres.

Daylily hybridizers have noted seedlings with striped foliage from time to time, but for one reason or another these have not been perpetuated, and the only variegated clone in general culture is the one discussed herewith.

The leaves are handsomely striped with longitudinal bands of purest white, the flowers but sparsely produced are of the double Kwanso type that many people consider monstrous and unattractive. As in its all-green prototype, the foliage of the variegated form disintegrates in the autumn and does not reappear until the following spring is well under way.

¹ Stout, A. B., Daylilies, Macmillan, New York, 1934.

² Kojan, Selma C., Flowering periods for clonal varieties of daylilies. HERBERTIA, vol. VII, p. 209.

In common with most clones of *Hemerocallis fulva* the Variegated Daylily increases by stolons, new plants appearing at some distance from the crown. All too often these ramets revert to type and it is necessary to remove these non-variegated plants lest the clumps become predominantly green.

Because of its slowness of growth, its lack of winter foliage, its marked tendency to reversion, the Variegated Daylily, *Hemerocallis fulva* clone *Kwanso Variegatus* is of questionable value in Florida gardens.

DAYLILIES IN GARDEN DESIGN

JOHN V. WATKINS,

Asst. Professor, Horticulture, University of Florida

It is generally agreed among discerning gardeners that herbaceous perennials should be subordinate to the more important woody species in the landscape picture. In the charming scene, shown in Figure 67, the bold clumps of *Hemerocallis* are supplementary to the thuyas and serve

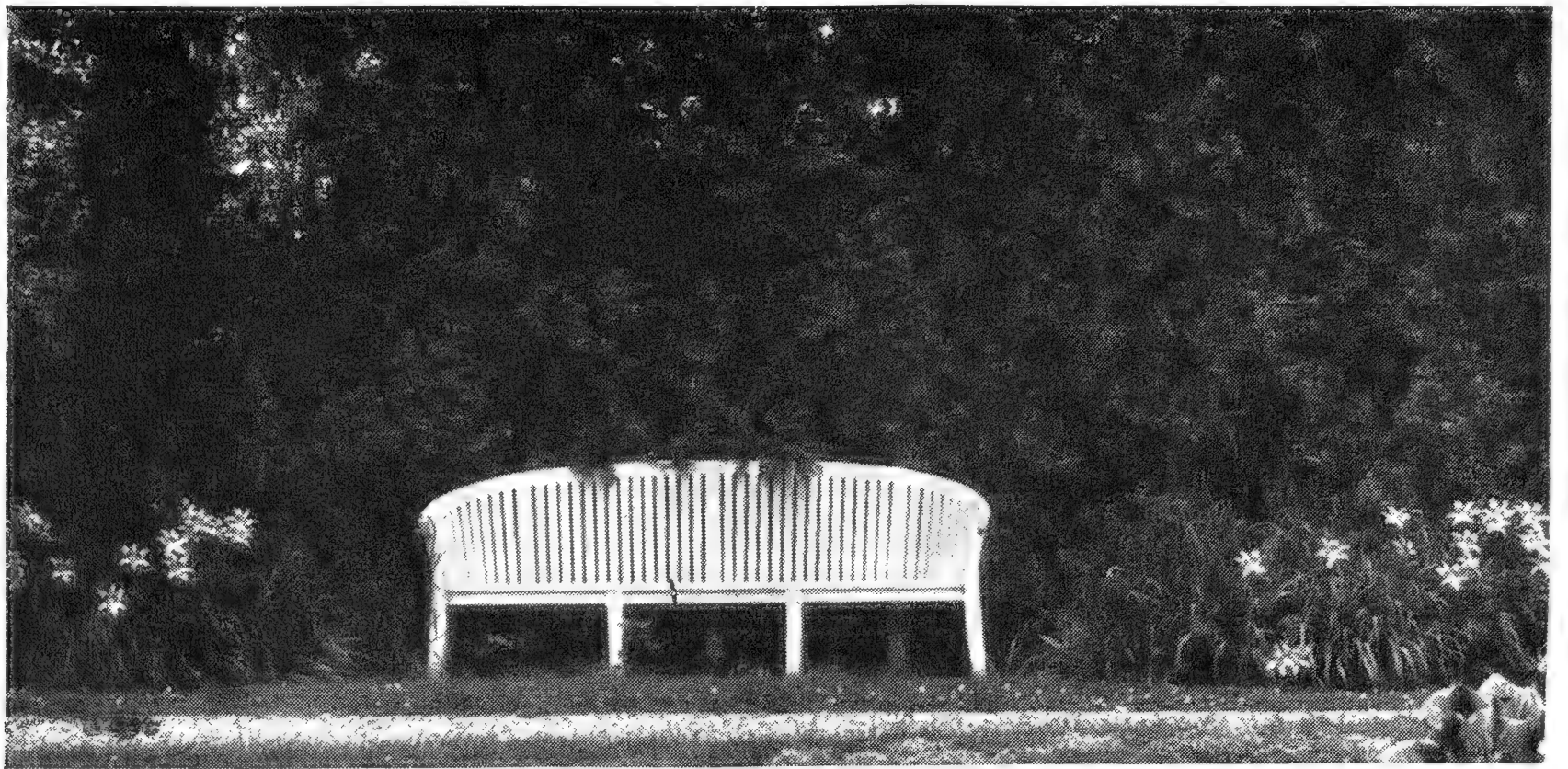


Fig. 67. Use of daylilies in landscape; the bold clumps of daylilies are supplementary to thuyas and serve as accessories to garden seat, the center of interest. Photo by Prof. John V. Watkins.

as accessories to the garden seat, which is, of course, the center of interest. The daylilies materially contribute toward good focalization and give a definite finish to the picture.

This is one of the most graphic illustrations of the correct use of daylilies that this writer has found and it is presented herewith as an excellent example of "what to do with my daylilies." Here, the designer has skillfully incorporated the important principles of good planting. Simplicity, unity, harmony, balance, and a good scale relationship are all present and all of these serve to create a picture that is beautiful and satisfying.

WHY I AM INTERESTED IN DAYLILIES—1941 REVISION

ELMER A. CLAAR, *Illinois*

After reading my article in *HERBERTIA* for 1940 entitled "Why I Am Interested in Daylilies," I felt like the fellow who when inebriated went into a barroom and bellowed, "I can lick anybody in this bar." No one paid any attention to him. A little later he said, "I can lick anyone in this town." Still no one paid any attention to him. Then he boasted, "I can lick anyone in this state." Finally a little Irishman got tired of this and gave him a good trimming. After it was all over the big fellow said, "I think I covered too much territory."

I feel just that way about my article last year and I would like to amend a few sentences and take in just a little less territory. I am referring to this sentence: "Daylilies can stand neglect, insect pests, lots of rain, lots of drought and you don't have to have sprays or any special cultural requirement."

In June I met Mr. Edward Steichen and he told me that thrips were in his daylilies and were a serious pest. I saw thrips in Dr. Stout's garden. He said they were especially fond of *H. citrina* and *H. multiflora*. I did not see them or perhaps I did not recognize them in the other gardens that I visited. I also saw plenty of Japanese beetles in Dr. Stout's daylily garden. They eat the flowers.

This year was especially hard on all perennials. In the fall of 1940 it was unusually warm for a late period and vegetation was lush green. Then overnight the temperature dropped from around 70 F. to 10 F. above zero. It killed many perennials completely. Some of my daylilies were completely winter-killed, for example Mr. Sass' *Golden West*, Mrs. Nesmith's *Pink Charm*, Mr. Hayward's *E. W. Yandre*, *Minnie*, *Sally*, *Florida* and *Osceola*, Dr. Traub's *Granada*, *Victory Taierhchwang*, *Dr. Stout* and *St. Joan*. Some of them died back so badly that I thought they were dead and ordered new ones; but they did come up later on but did not bloom for me; for example, *Wolof*, *Vulcan*, *Chengtu*, *Princess*, *Indian Chief*, *Duchess of Windsor*, *Pink Lustre*, *Emperor Jones*, and *Persian Princess*.

In spite of the possibilities of diseases in daylilies and some slight amount of winter-killing, I still find that I get a maximum amount of fun with a minimum amount of time in raising daylilies, and that they will grow in my garden under the trees, and that they are at their best when the heat and drouth of July and August are here and when other favorites are out of season.

FOOD MANUFACTURE AND FLOWERING IN THE DAFFODIL

JOHN GRAINGER, *Huddersfield, England*

The fact that plants are capable of making solid food from the constituents of air and water is of fundamental importance to the human race, and in particular, to its executive officers, the gardeners. A full comprehension of the factors which affect this manufacture of food is a necessary equipment of any horticulturalist who wishes to control his plants by forcing, or who desires to excel his fellows with beauty or fullness of plant growth. There are perhaps few natural orders which provide such widespread opportunity for the expression of this skill as the Amaryllidaceae. Its members are carried from wild, untamed grandeur at one end of the earth to provide dignified and stately beauty at another; their tolerance of forcing practice in the noble bondage of glass-house culture only serves to extend their usefulness.

A study of the food-making capacity of the daffodil provides many instructive features for the practical gardener. The descriptions which follow relate to plants of the variety *King Alfred*, growing as nearly as possible free from horticultural restraint. They were, however, neither so wild nor so numerous as Wordsworth describes:—

*Ten thousand saw I at a glance,
Tossing their heads in sprightly dance.*

The present investigation was inspired by a desire to know more about the food manufacture of the daffodil in relation to its flowering. A schedule of flower formation was described in the 1938 number of HERBERTIA by the present writer, but it was not then possible to align the stages of flower growth with food manufacture, since very little appeared to be known about the last-mentioned subject. The flowering of certain plants is directly controlled by their type of food manufacture or metabolism. Late chrysanthemum and Soya bean, for instance, flower in the short days of autumn because a delay in the nightly transport of food hinders the supply of carbohydrates to the growing point for some hours after the onset of darkness. (Grainger 1938) Other plants, such as the common English Coltsfoot, *Tussilago farfara* and *Saxifraga tridactylites* begin to form the first flower initials in the late months of autumn, when food manufacture by the leaves is at a minimum (Grainger 1939). The daffodil has obviously some connection with the last-mentioned types for its flower bud is made after leaf growth has ceased. This may, however, prove on investigation to be the time when most food is concentrated in the bulb.

THE AMOUNT OF FOOD EXPENDED UPON FLOWERING AND FRUITING

It is commonly supposed that flowering and fruiting make a serious drain upon the food resources of a plant, but this is so only in a few species, and the daffodil is not one of them. (Table 1.)

These figures may be compared with the garden Lupin, *Lupinus polyphyllus*, on the one hand, where the very abundant fruits accounted for nearly 23% of the dry weight of the whole plant, and with the Wood Anemone, *Anemone nemorosa*, on the other, where the fruits of a colony of plants only required 0.32% of the total dry weight.

TABEL 1

Distribution of dry weight in reproductive and non-reproductive parts of the Daffodil

Date	Condition	Total dry weight of plant in grams	Dry weight of reproductive parts* in grams	Percentage reproductive dry weight of total dry weight
11 April 1939	Flowering	3.16	0.113	3.60
		4.21	0.12	2.85
18 June 1939	Fruiting	4.48	0.18	4.01
		18.22	0.72	3.95

* Flower stalks of the daffodil contain chlorophyll and can presumably manufacture carbo-hydrate food, so the weights of reproductive parts are those of only the flowers and fruits.

TABLE 2

Dry weights of various organs of the daffodil at different times of the year

	Oct. 6	Nov. 15	Feb. 23	Apr. 11	May 23	Jun. 18	Oct. 1
	Grams	Grams	Grams	Grams	Grams	Grams	Grams
Roots	—	0.027	0.042	0.277	0.24	0.12	
Bulb	2.13	2.10	0.97	1.198	2.51	2.93	2.20
Leaves			0.32	1.042	0.83	0.53	
Flower stalk				0.53	0.62	0.72	
Flower				0.113	0.14		
Fruit						0.18	
Total	2.13	2.127	1.332	3.160	4.34	4.48	2.20

TABLE 3

Amounts of total carbohydrate and of total nitrogen in various organs of the daffodil at different times of the year

	Oct. 6		Nov. 15		Feb. 23		Apr. 11		Jun. 18		Oct. 1	
	% Total Carbo-hydrate	% Total Nitro-gen	% Total Carbo-hydrate	% Total Nitro-gen	% Total Carbo-hydrate	% Total Nitro-gen	% Total Carbo-hydrate	% Total Nitro-gen	% Total Carbo-hydrate	% Total Nitro-gen	% Total Carbo-hydrate	% Total Nitro-gen
Roots				3.06	25.58	3.56	14.20	2.82				
Bulb	76.25	2.94	73.46	1.00	61.48	2.92	55.48	1.70	88.56	1.19	75.16	2.99
Leaves					36.97	4.22	39.67	2.98	35.29	2.66		
Fl. stalk									44.16	1.97		
Flower							36.96	1.71				
Fruit									36.97	2.98		

The daffodil also shows another difference from many plants in that fruiting accounts for only a slightly higher percentage of total dry weight, than does flowering. It has, indeed, been found on one or two

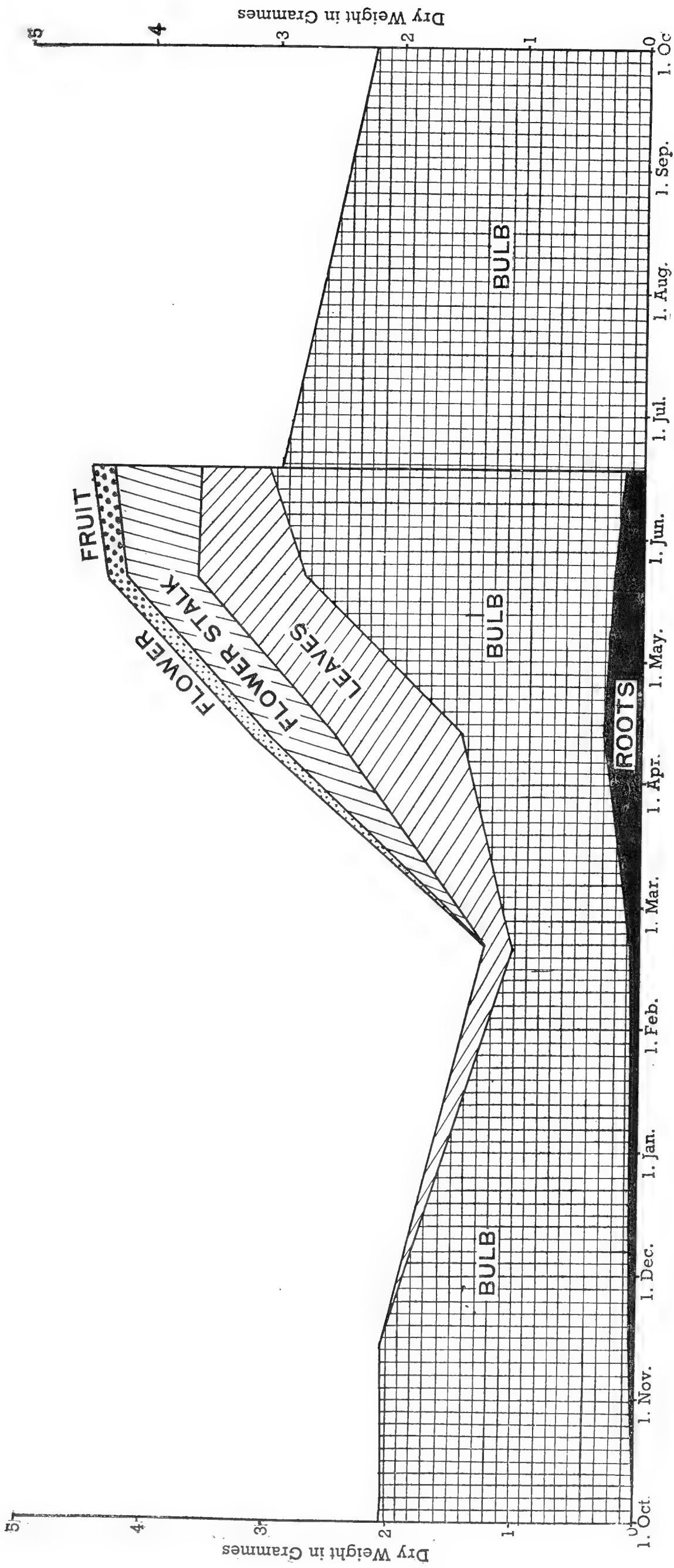


PLATE 216 A. Distribution of dry weight in the Narcissus plant through a period of one year.

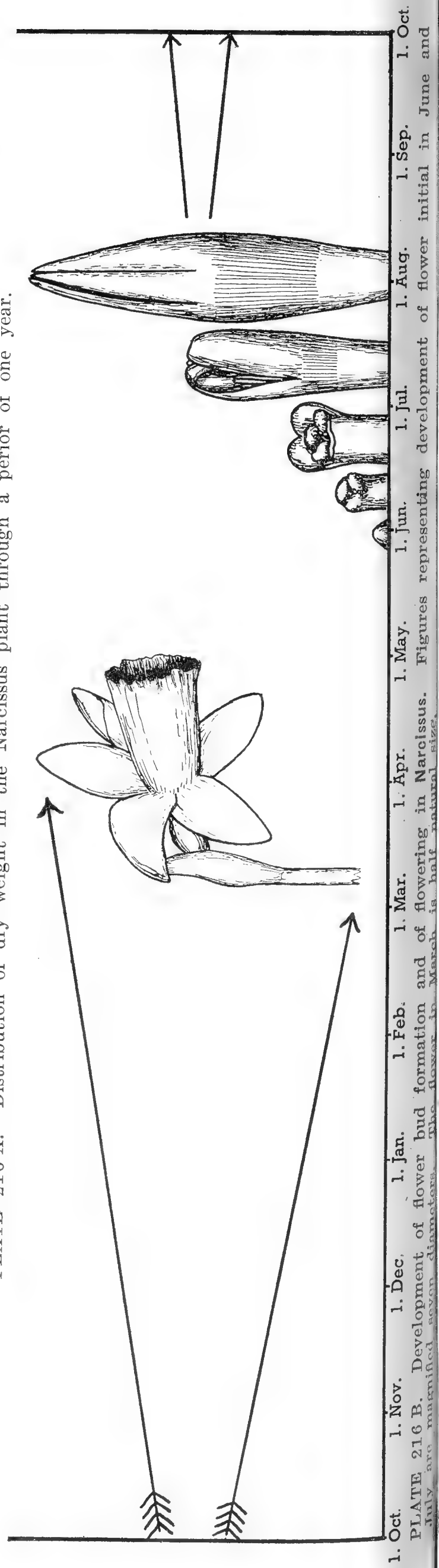


PLATE 216 B. Development of flower bud formation and of flowering in Narcissus. Figures representing development of flower initial in June and July are magnified seven diameters. The flower in March is half natural size.

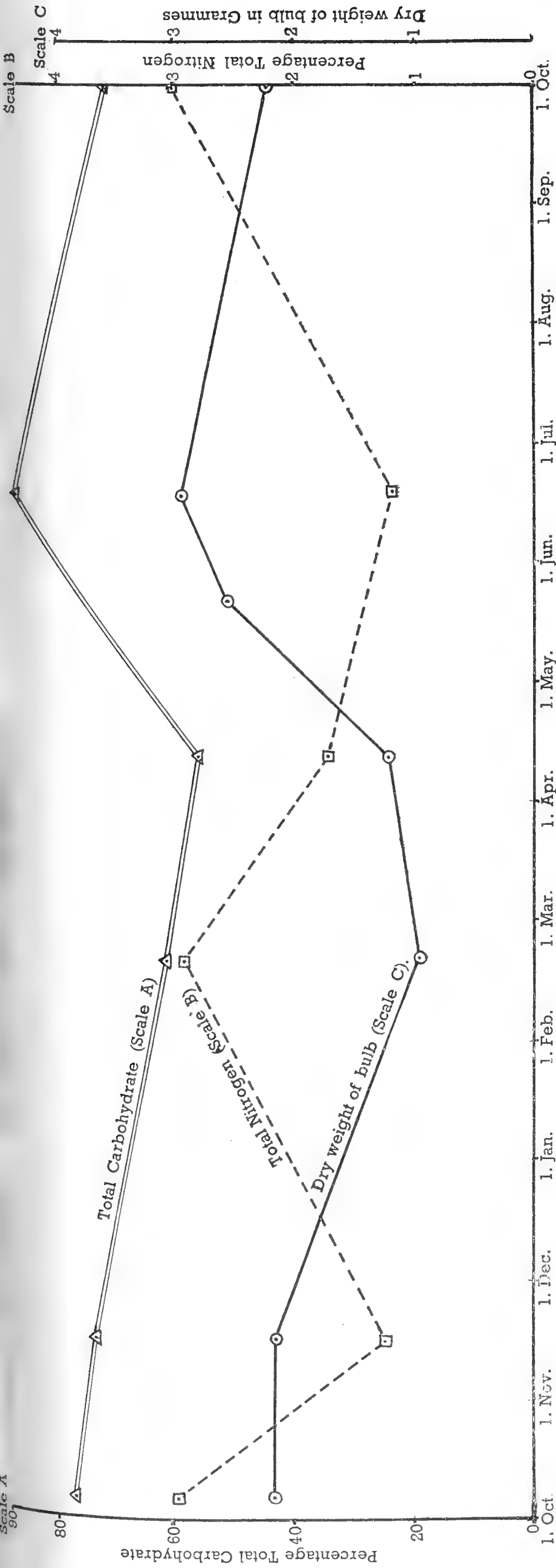


PLATE 216 C. Contents of total carbohydrate and of total nitrogen in the Narcissus bulb, compared with dry weight of the same organ.

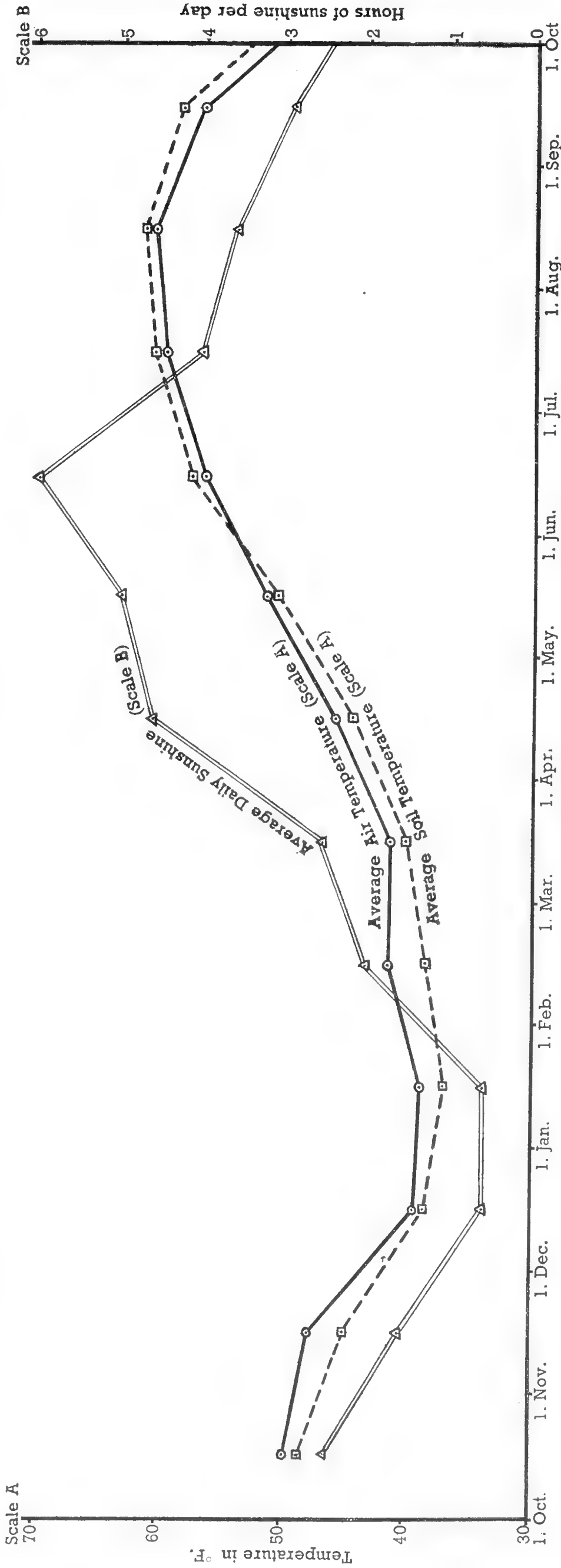


PLATE 216 D. Meteorological data relating to the growth of the Narcissus bulb. The air temperature is measured in a screen four feet from the ground, the soil temperature is that at a depth of four inches.

occasions that fruiting may account for even a lower percentage of the total dry weight than the corresponding flowering stage. This, however, is usually found on larger plants than those described in these experiments, and is due to the extra food made by the leaves while the fruit is developing. For comparison, the Evergreen Bilberry, *Vaccinium Vitis-idaea*, has 0.7% of its dry weight devoted to flowers, but 5.6% is accounted for by fruits; Rose-bay Willow Herb, *Epilobium angustifolium*, expends 6.5% of its solid substance upon flowering, but fruiting consumes 14.7%. Further data for other species are given in a recent paper by the present writer (Grainger, 1940).

More detailed studies have been made. Table 2 and Plate 216A show the distribution of dry weight in various organs throughout the yearly cycle of growth.

Plate 216A shows very graphically the development of the bulb at the expense of its stored food between mid-November, and mid-February, and the succeeding rapid growth until the middle of May. Thereafter, the dry weight of the bulb increases whilst that of the leaves diminishes by a similar amount, indicating a transfer of material from the leaves to the bulb during this period. Changes in dry weight of the flower stalk are also illuminating; this organ is green, and could presumably manufacture carbohydrate food in some degree. Plate 216A suggests, however, that there is no transfer of food from the flower stalk to the bulb between mid-May and mid-June, when the leaves confer a certain amount of dry weight upon the bulb. The flower stalk therefore stands suspect as a rather useless repository for a considerable amount of dry weight, when judged from the standpoint of preparation of the bulb for forcing. This knowledge suggests the practical treatment that when flowers are to be removed to conserve the bulb's energies for forcing, it would be better to nip them out at an early stage, before the stalk claims its large portion of dry matter from the general stock of the plant.

Comparison of Plates 216A and 216D shows that the phenomenal increase in dry weight of all organs of the plant which takes place between March 1st and June 1st. occurs at a time of year when the average daily sunshine is high, and the average temperatures of both air and soil are relatively low. Wasting processes (respiration) of the plant are greater than food manufacture from December to March, when there is little daily sunshine. The growth of leaves is initiated in December when the temperatures are minimal, and growth of all organs is arrested in June, before the temperatures are maximal. It therefore appears that the climate conditions which favour quickest growth of the daffodil plant are days with plenty of sunlight and relatively low temperatures of between 40° and 50° F.

An experiment was designed to test this point.* Sixty bulbs were chosen for that small size which usually indicates absence of a developing flower. They were potted and grown outside until established, and were

* Thanks to the help of Mr. T. F. Armstrong, head gardener of the Ravensknowle Park.

then divided into three groups. One group was grown in an experimental chamber with average temperature 62 degrees Fahrenheit, and 12 hours' daily illumination from a 100 watt electric lamp controlled by time switch. Plants in the second group were grown at the lower temperature of 55 degrees Fahrenheit with the same duration and intensity of artificial light. Those remaining in the third group were subject to the same lower temperature and a shorter duration of artificial light, namely 8 hours daily. The illumination was of 230 foot candles intensity round the tips of the leaves. The plants were grown in the chambers for 28 days, from April 1st to 29th, 1941. Ten plants were taken from each chamber at the end of this period, the bulbs and roots

TABLE 4

Increase in dry weight of daffodil plants grown at different temperatures and varying durations of artificial light

Group	Treatment	Volume of the bulbs of 10 plants. ml.	Total dry weight of 10 plants, grams	Grams of total dry weight per ml. of bulb volume.
	Before the experiment	145	25.6	0.176
1.	After 28 days at 62 F. with 12 hours' daily light.	186	36.7	0.197
2.	After 28 days at 55 F. with 12 hours' daily light.	143	31.1	0.217
3.	After 28 days at 55 F. with 8 hours' daily light.	170	33.2	0.195

were carefully freed from soil, and the dry weights of the bulb, roots and leaves determined for each plant.

It is somewhat difficult to compare the dry weights of a number of plants of varying size, but the volume of the bulb is roughly proportional to the total size of the plant. The results in Table 4 are accordingly expressed as grams of total dry weight per cubic centimetre of bulb volume.

The level of growth is low in the artificial conditions of the chambers, but the results confirm that food manufacture is significantly greatest in the second group where growth took place at the lower temperature and longer duration of daily illumination.

This conclusion does not at first appear to be in line with practical experience in forcing, where the temperature is at first low, and is later raised progressively as the leaves elongate and the flower appears. It is clear, however, (Grainger and Crawshaw 1939a) that the higher temperatures at the close of forcing favour the rate of *emergence* of the flower, and are not specifically directed towards food manufacture. It is well known that forced bulbs are greatly depleted of food reserves, and are either discarded, or have to be restored to forcing vigour by two or three years' vegetative growth. Full judgment cannot be passed on this matter in the absence of further data, but the experiments here reported suggest the possibility of providing a bulb with the necessary stores of food immediately after forced flowering by growing it at a

TABLE 5

Diurnal carbohydrate metabolism of the daffodil

Date & Time 1939	Total Solids % of fresh weight	Water % of fresh weight	Sol. Solids % of dry wt.	Insol. Solids % of dry wt.	Total Carbo- hydrate % of dry wt.	Soluble Carbohydrate % of dry wt.			Insol. Carbo- hydrate % of dry wt.
						Reduc- ing	Non-re- ducing	Total	
Jan. 28, 3.00 p. m.	14.66	85.34	34.70	65.30	38.25	10.6	18.3	28.9	9.35
Jan. 28, 6.00 p. m.	13.12	86.88	38.53	61.47	40.23	19.2	18.5	37.7	2.53
Jan. 28, 9.00 p. m.	15.34	84.66	40.09	59.91	41.20	11.3	23.5	34.8	6.40
Jan. 29, 1.00 a. m.	15.55	84.45	34.23	65.77	40.22	9.4	18.2	27.6	12.62
Jan. 29, 5.00 a. m.	14.79	85.21	35.92	64.08	39.51	8.9	17.2	26.1	13.40
Jan. 29, 8.30 a. m.	15.16	84.84	36.60	63.40	40.20	10.1	14.6	24.7	15.50
Jan. 29, 12.00 noon	14.81	85.19	42.00	58.00	38.55	11.2	14.3	35.5	13.05

relatively low temperature with good light, increased artificially if necessary. One or two florally unproductive seasons of resuscitation might thereby be saved.

Plate 216C shows the relation between dry weight of the bulb and its contents of total carbohydrate and total nitrogen. The changes of dry weight are fairly closely reflected by similar changes in the total carbohydrate as might be expected, since this kind of food accounts for such large percentages of the dry weight—nearly 90% when growth ceases in June. The total nitrogen appears to be organized upon opposite lines, being in general low when the total carbohydrate and bulb weight is high, and vice versa. The initial fall in nitrogen between October and November is probably due to its utilization in growth, but

the apparent minimum in June is possibly caused by the increase in bulb weight, while the actual amounts of nitrogen remain substantially the same.

The formation of next year's flower initial begins almost immediately after growth of the shoot is arrested at the beginning of June (Plate 216B.) This is also the time when there is most carbohydrate and least nitrogen in the bulb, and it would therefore appear to confirm the thesis of Kraus and Kraybill (1918) that a plant tends to flower when the ratio of carbohydrate to nitrogen is high. There is, however, no objection raised by the data here presented to the idea expressed by the present writer (Grainger 1939) that the total amount of available food in the growing point may be more important in some plants than the ratio between carbohydrate and nitrogen.

DAILY NUTRITION OF THE DAFFODIL

The solid substance of a Narcissus plant is trebled in three months between mid-February and mid-May (Plate 216A) and this can only be regarded as a considerable physiological accomplishment, for the size of the plant. Some investigation of the mechanism of this increase gives illuminating results. It might be expected that the capacity for manufacturing food and the ability to transport it would both be very efficient

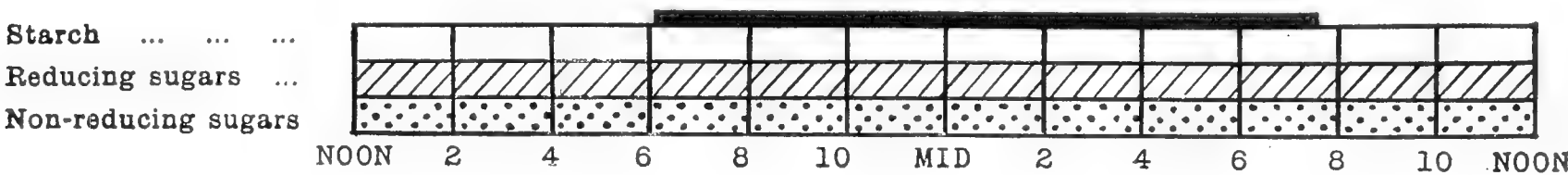


Fig. 68. The results of qualitative analyses for reducing sugars and non-reducing sugars in daffodil leaves on Jan. 28 to 29, 1939. Shading and dotting indicate the presence of the respective sugars; samples were taken at approximately three hour intervals. Duration of the hours of darkness is shown by the thick black line above the diagram.

systems. Fig. 68, Table 4 and Plate 217 show that the system of transport is indeed a good one. The presence of either reducing or non-reducing sugar appears to be a necessity for adequate transport, and both can be detected qualitatively through the whole 24 hours in Daffodil leaves (Fig. 68). Table 4 and Plate 217 demonstrate the quantitative dealings in carbohydrate of daffodil foliage through a period of 24 hours in January 1939.

Many plants show a daily fluctuation of total carbohydrate expressed as a percentage of the dry weight, (Grainger, 1939) thus providing evidence of transport of this kind of food away from the leaves during the night. Several plants with completely mobile carbohydrates, however, exhibit a uniformity of total carbohydrate content throughout the whole 24 hours, and when this is combined with the qualitative demonstration of soluble sugars through the day and night, it represents an organization where the carbohydrate is completely mobile. The daffodil has this arrangement (Plate 217A and Fig. 68). Figures and curves which portray the various carbohydrate fractions in Table 4 and Plate

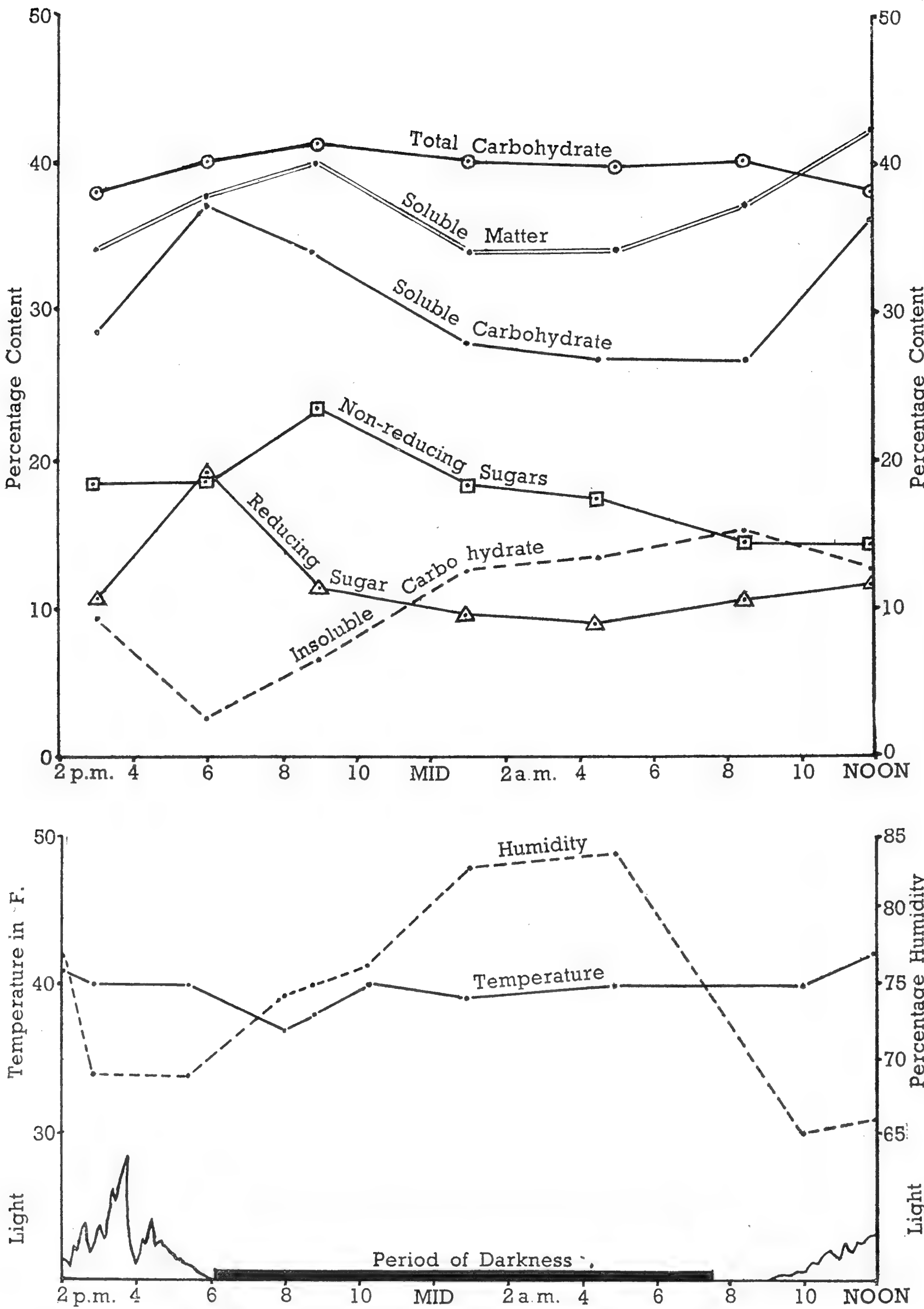


PLATE 217. Upper, quantitative estimations of carbohydrate fractions in *Narcissus* leaves. Jan. 28-29, 1939; lower, meteorological information for the same period.

217 give some indication of the mechanism of transfer. Curve E Plate 217 showing reducing sugars, is practically the inverse of Curve F, showing the insoluble carbohydrate. This suggests that the reducing sugars are derived directly from the insoluble carbohydrate. A peak on Curve E (reducing sugars) at 6 p.m. is followed by a maximum upon Curve D. (non-reducing sugars) further suggesting that the reducing sugars are transformed to the non-reducing form which is presumably the sugar of translocation in the daffodil. The general correspondence between curve B, (Plate 217) showing soluble solids as determined by weights of the residue after extraction of the soluble matter, and Curve C, obtained by sugar estimations, provides a check upon the qualitative changes.

It can therefore be stated that the daffodil exhibits complete mobility of its carbohydrate, a fact of prime importance to the successful accomplishment of the concentrated growth which occurs between March and June.

DISCUSSION

An important feature of the results here presented is the demonstration that daffodil plants, which make their flower initials when leaf growth is absent (Plate 216A and 216B), really begin floral formation at a time of maximum carbohydrate content of the bulb (Plate 216C). It is also a time of high ratio between total carbohydrate and total nitrogen, but the author suggests, upon evidence from several other plant species, that this is not necessarily causal. Flower initiation certainly appears in general to take place only when there are adequate supplies or stores of food, and the present results show that the daffodil, making its flower initial at the beginning of the dormant period, has then indeed the highest content of carbohydrate food in the bulb of any time during the year.

The daffodil has some important limitations; it cannot have more than a certain number of roots, and as these never branch, the area of water intake is limited. This is perhaps the most potent cause of the arrest of growth in June, for at this period, water contents of soil are lower than in the months when growth is taking place. There is also another cause, for the yearly increment of a bulb is also limited (Graininger 1938a), and when this combination of scales and swollen leaf bases is filled with carbohydrate (to the extent of nearly 90% of its dry weight in June) no further growth would be possible.

SUMMARY

The experiments here reported are for the Daffodil variety *King Alfred* grown and flowered under natural outdoor conditions at Huddersfield, England. They were planted Oct. 6th, flowered March 26th in the following year; the bulbs were lifted June 18th and were planted again on Oct. 1st.

Practical

1. It is shown that the flower stalk claims a large amount of dry weight which is of little use to the bulb. Removal of the flower from bulbs required to be built up for forcing should be done at an early stage, in order that a minimum of dry weight shall be locked up unnecessarily in this organ.

2. A suggestion is made that a relatively high daily average of sunshine and a relatively low average temperature, between 40 and 50° F. provide the external conditions which favour the most rapid food manufacture of the daffodil. This suggests the practical possibility that the food reserves of these plants might be built up faster, immediately after forcing, by providing the best conditions for food manufacture. Experiments are in progress to test this possibility.

Physiological

3. Formation of the flower initial in the daffodil begins at the cessation of growth in early June, when there is a large amount of carbohydrate in the bulb (nearly 90% of its dry weight), and but little nitrogen in proportion. Flower initiation during the dormant period of the bulb is therefore accomplished under optimal conditions with regard to the total carbohydrate food available.

4. Evidence for the complete mobility of carbohydrate in daffodil leaves is presented. This would account for the tripling of dry weight of the plant in three months, between mid February and mid May. Reducing and non-reducing sugars are detectable qualitatively throughout the whole 24 hours of one day, and quantitative estimations confirm the fact. The mechanism of transfer seems to be that non-reducing sugar (sucrose) is the sugar of translocation, and is formed from reducing sugars derived from the insoluble carbohydrate.

APPENDIX

Methods used in the determinations

Dry weights were obtained by heating the tissues to 100° C. in a water-jacketed container for 30 mins. and then at 65° C. to constant weight. The dried tissue was powdered and preserved for analysis.

Total carbohydrate was estimated by hydrolysing a weighed portion of the dried extract with 3% sulphuric acid for 3 hours. The mixture was then neutralised with sodium carbonate, filtered, washed with distilled water and made up to a standard volume. Carbohydrates were estimated in this liquid by the method of Willaman and Davidson (1924). Soluble material was extracted from a separate weighed portion of dried material by cold 95% alcohol, acting for at least 36 hours. The mixture was then filtered, the residue washed with alcohol and the filtrate made up to standard volume with more alcohol. Reducing and non-reducing sugars were estimated by the respective techniques outlined by Willaman and Davidson (1924). Total nitrogen was obtained by a micro method modified from that of Pregl (1930).

The meteorological data for Plate 216 are from routine observations made at the Ravensknowle Meteorological Station, and the writer wishes to acknowledge the kind assistance of his colleague Mr. E. W. Aubrook in this connection. The data for Plate 217 were obtained by mercury thermometer and by spinning hygrometer, but the light record is from a photoelectrical apparatus.

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CULTURE OF NARCISSUS SEROTINUS

DREW SHERRARD, *Oregon*

The autumn-flowering daffodil, *Narcissus serotinus*, is a small silvery white star, blooming on a slim stem six inches tall. As the flower ages, the stem increases in height to eight or ten inches. (See Plate 218.)

Shaped like the shallow-cupped large daffodils, this miniature has a yellow cup so shallow that it barely rises above the white perianth. The one leaf usually equals or exceeds the flower stem in height by the time the flower is well open.

Having lost my first bulbs by freezing, I have learned not to risk them outside in Oregon. Instead they are grown in a pot, and spend the spring and summer outdoors but are brought inside in October when the buds are showing. This makes it possible to enjoy their blooming at close range, and also their fragrance, for this is a sweet-scented daffodil. The flowers pass, and seeds form and ripen on a sunny window sill.

As soon as spring is well advanced, the pots are taken outside and the bulbs ripened off. Repotting is done when the bulbs are dormant, and the pots left without watering till autumn rains start them into root



The Oregonian, Portland, Oregon

See page 145.

Plate 218

Narcissus serotinus

growth. I have used a light loam, with sand and leafmold added. Young bulbs have but one flower on a stem, but older ones produce two or three on a stem.

NOTES ON HARDINESS OF AMARYLLIDS

BENJAMIN G. FERNALD, *Virginia*

I have only recently become a member of the Society, but have acquired a complete file of the annual publications, and I have read with much interest all references to the outdoor hardiness of members of the *Amaryllis* family. Of course, certain members of this family have been grown for years almost all over the country without any ordinary gardener having any idea that they were Amaryllids; e.g., daffodils and daylilies. My acquaintance with gardening of any kind is hardly more than ten years old, and started through accident rather than intention. Having read an article by a lady gardener of much experience in *Garden Gossip* about how many plants had proven hardy for her in middle Virginia, I searched around among catalogs and bought as many of the ones she mentioned as I could locate and a good many others. As might have been expected, her experience had been acquired during a fifteen-year period of mild winters, and the year after I planted my bulbs we had the hardest winter for many years, and since then every other winter has been as severe or worse. My innocence will be understood when I say I planted outdoors in a moderately protected situation freesias, babianas and ixias. I also secured a dozen bulbs of *Amaryllis* hybrids and five varieties of *Crinum*, viz., *Powellii album*, *Kirki*, *giganteum*, *americanum*, *frimbriatulum*, also *Ismene calathina*. My recollection now is that the tender bulbs were planted in the fall, and the *Crinum* in the spring, but as ten years have elapsed, I am not sure; in any event, I recall that in spite of the very severe winter a few of the freesias and babianas actually bloomed, and all the ixias, also several varieties of the *Ornithogulum* group. The ismenes lived but did not bloom. The *Amaryllis* and the *Crinum* all bloomed, but only *Powellii album* survived, as did the hybrid *Amaryllis*, and all are still going strong after many transplantings; also, *Sternbergia Lutea*, *Lycoris radiata* and *L. squamigera* are as hardy as oak trees. *Amaryllis advenum*, (which I purchased as *Habranthus miniatus*) *Zephyranthes candida* and *Z. grandiflora* (*syn. Z. carinata*) are also perfectly hardy without protection, although the latter does better with a winter mulch. In fact, I generally wait until the first freeze and put a heavy coating of stable manure over all the plants whose foliage is killed by freezing. This reduces the damage to the bulb neck, prevents heaving and thoroughly saturates the soil with fertility during the winter rains and snows. All of this mulch is removed in the early spring.

Another member of the family which has proven to be hardy without protection is *Cooperia pedunculata*. *Sprekelia formosissima* has proven to be reasonably hardy, although in a very bad winter I lost part of the bulbs. Still another member is *Chlidanthus fragans*. This is entire-

ly hardy without protection, but splits up and multiplies so rapidly that I believe it advisable to dig both it and *Sprekelia* every fall along with *Ismene calathina*, and replant in the early spring.

Among the various members of the family listed above, many valuable from the floral standpoint in beds, are not suitable for cutting, others can be cut but do not last long enough to make it worth while. *Lycoris* species are about as longlasting after cutting in this hot climate as any flower I can recall. And they are freer from disease and require less spraying, working, watering, bulb dipping and the other burdens imposed on gardeners than any competitive flowers. Because of the relatively little garden labor required to achieve moderate success, the Amaryllis family interests me very much, and I am experimenting with a number of kinds other than those mentioned and will report on them later.

In giving this report on hardiness, I wish to explain specifically that my experiments were conducted on the north bank of the James River a few miles above Newport News, Virginia, and on the north bank of the York River diagonally opposite Yorktown, Virginia. Both of these locations are outside the long tongue which runs up the Coast, and according to government charts, has virtually the same climate as the Gulf of Mexico. As a clue to plant hardiness in this climate, I might mention that fig and Crepe Myrtle bushes have been in the past thirty years killed back to the ground, but put up new growth. I believe the proximity to relatively large bodies of salt water is favorable to semi-tender plants and that, e.g., the climate of Wilmington, North Carolina is more nearly like that of Atlantic City, New Jersey, than it is like that of Asheville in its own state. For this reason, hardiness notes with no more definite location than the name of a State may be very little help in guiding an experimenter. In my observation, the depth to which the ground is frozen depends on the duration of the freezing weather as much as the lower thermometer reading. Some bulbs, such as *Narcissus*, can be frozen stiff above ground without roots or foliage, and subsequently planted and grow and bloom. Other bulbs can have all the foliage frozen off, and themselves frozen stiff and survive if they had a well established root system before they were frozen. I have not found the depth of bulb planting to have any influence on hardiness.

One of the reasons for the infrequent use of members of the Amaryllis family (not counting daylilies and daffodils) in garden planting is that so few of them have any popular non-botanical name which is standard and well known. When visitors point at a bed of a variety in bloom and ask what it is, and I can tell them that it is Evening Star, there is some chance of their remembering it, but if I tell them that it is *Cooperia pedunculata*, it is easy to see that they haven't the faintest idea of even trying to remember the name. In my experience, aside from the large Hybrid Amaryllis which are generally known and recognized as such from seeing them growing in pots or florist's show window, all specimens of *Crinum*, *Lycoris* and *Hymenocallis* are called lilies. Perhaps, the visitors are correct. According to the most general meaning

of the word “lily”, as in “lilies of the field” in the Bible, it is equivalent to “flower”. In the somewhat more restricted sense it is used for flowers that are liliaceae-like—various amaryllids, irids, etc., and in the most restricted usage it refers to liliaceae which are species of the genus *Lilium*. I believe we need someone with a good imagination to give a new set of names to the members of the family which may become popular and then do some propagandizing to make them so. This is as essential as the establishment of the fact that many of them are perfectly hardy over a large part of the country in spite of the fact that most of the bulbs are sold by catalogue houses who practically always refer to them as tender bulbs for house culture.

THE DESERT LILY, *HESPEROCALLIS UNDULATA*

LESTER ROWNTREE, *California*

Even old timers are unable to predict a good Desert Lily year. Numerous blooming plants with tall well flowered stems do not always follow a rainy winter. Last winter's rains were record breaking but in April, when, after a year's absence from California, I got back to some of my happy hunting grounds in the desert, I found *Hesperocallis undulata* puny and few-flowered. It may not be the amount of rain after all but the *time* when the rain comes, that affects the season's growth and bloom of most California native plants. In order to function at their best some of them must have the moisture just when they need it. If it is a winter deluge that produces bloom, last spring should have been a banner one for wild display. Instead, it brought a superb show of many species of flowering bulbs, while the performance of others, as well as many annuals and herbaceous plants was barely normal.

Like much other California vegetation, the Desert Lily has a short and vigorous growing season. The leaves spear the desert floor in February. By early May every sign of life—stem, leaf and even seed pod—has vanished. Between its appearance and disappearance, a great deal has been accomplished in a short time. The narrow luminous basal leaves of iridescent blue-green, leathery, wavy and white-margined, lengthen to almost two feet, and arch to touch the earth with their points. The bluish flower stem thrusts erectly upward to over eighteen inches (See Plate 219). Buds form, expand into flowers and the flat seeds, packed tightly in rows, go jet black in their three-lobed subglobose capsules.

Sometimes the stem has one or two side branches. The flowers on these expand concurrently with those on the main stem. Only a few blooms come out at a time and they follow no regular order of opening although the lower buds usually break first. Fifteen buds and flowers is a good average and on one or two plants I have counted sixty. The lovely flowers keep coming out during the day. One afternoon I watched five blooms, on the same raceme, expand one after another, all within an hour. If the stem is picked and not plunged, the flowers come out just as though the stalk was either placed in water or still on its bulb.



Harry H. Haworth, Pasadena, Calif.

The Desert Lily, Hesperocallis undulata

The flowers usually remain out for two days. The petals are white and waxy with slightly waving edges. Down the middle of the reverse runs a broad stripe of a shade of light green containing both blue and gray; dark enough to show through to the inside of the flower and very much in evidence on the long upward-pointing buds. Inside the flower, the waxy filaments tipped with golden anthers are exceeded by the white pistil.

Though *Hesperocallis undulata* is fond of open sun-scorched places, it is found consorting with many desert plants. It likes flat sandy spots with the attending Burro-weed, *Franseria dumosa*, and atriplex and *Parosela* species. It has a preference for Mesquite, *Prosopis chilensis*, crowned hummocks. It has an inclination for sandy washes, especially those where a thin layer of clay has covered the top during rains and at the time of the plants flowering is dry enough to crack, peel off and curl up. Perhaps the unusually heavy rains of last winter left too thick a crust over the sand, for I noticed that many of the lily spears had not been able to penetrate it. Others had pierced the surface but seem to have spent their strength doing so for they began blooming when only a few inches high.

California boasts many superb stands of Desert Lily, but the bulb reaches the height of its development in southwestern Arizona and is especially abundant in a tiny range of mountains and an adjacent valley not far from the California border. The Indians call the lily, Ajo, which is Spanish for garlic, and use the bulb for food, and have given its name to the little mountain range as well as to a nearby junction.

Even though the bulb has a slight taste of garlic, the flower compensates with its delightful fragrance. My first Desert Lily bloom was found by literally following my nose. I pointed, hunting dog fashion, not toward the scent of garlic but at a strong and exotic fragrance, and moving in that direction, arrived at my lily, shining there in the moonlight.

I have never been successful in growing *Hesperocallis undulata*. That does not mean that it cannot be grown in captivity. The trial I gave it in Southern California was not a fair one and it would be hopeless to try it here on the fogbound Monterey Peninsula, though I long to experiment again.

I think the bulb would stand a good deal of cold. It can get bitterly cold at night on the Ajo Mountains. But it is a dry coldness and *Hesperocallis undulata* must not have dampness and cold at the same time. If the bulb were to be grown in a container that receptacle should be very deep as the lily bulbs are sometimes two feet beneath the surface. I would try one part clay and the rest sand and put several inches of small stone at the bottom of the pot or can. Once a week during the period of growth water should run through the container but no drop of it should remain there. There would be no good in attempting to grow the bulb unless it could be given intense dry heat during growth and for at least a month after all signs of life above ground had disappeared.

In the long run it would be simpler to pick up and move on to the desert.

THE STAR LILY, *LEUCOCRINUM MONTANUM*KATHLEEN N. MARRIAGE, *Colorado*

In fields of many prickles, in sandy waste places, beside those entrancing little by-roads of allure, this Star Lily appears when it is "Springtime in the Rockies." It is especially plentiful and at its loveliest on the mesa above Colorado Springs in such company as *Yucca glauca*, Cacti (*Opuntia* and *Echinocereus* species), *Argemone intermedia*, *Mentzelia nuda*; surprisingly thorny associates for a plant of such refinement, but the thin soil, extreme drainage, and sparse rainfall are sufficiently inhospitable to grass to permit these lovers of arid places plenty of elbow room.

Late April and through May *Leucocrinum montanum* blooms, the younger plants first, the older clumps later. Soon after Spring rain or snow, both foliage and flowers seem to emerge at once; long linear glaucous leaves radiate from the fleshy rootstock, the star-shaped fragrant glistening white flowers, with attractive yellow stamens rise from the crown, their long tubes (2 to 4 inches long) serving as a "stem." (See Plate 220.) In common with other long-tube beauties of the wild, a major operation is necessary in order to get at the seeds of this Lily. Several black seeds are contained in a transparent sac in the crown of the plant. The sac disintegrates about six weeks after the flowers have faded, so that the correct timing of the operation is important.

Reginald Farrer wrote "this Lily of the Mountains is a most entrancing species, worth any comfort that its fleshy roots exact. . . . and the apple of the eye should not be more cherished." It is interesting to note that the Star Lily thrived in a Yorkshire garden. It comes readily from seed, transplants willingly, grows happily, and blooms profusely, when planted in extremely porous soil—or just gravel—in full sunshine.

Here in our garden in Colorado Springs it is happy, and it is reported to be growing and blooming well in sunny rock gardens in New York State and in Virginia.

The whole top disappears completely about a month after flowering, and remains out of sight till the following Spring.

Colorado Springs, Colorado,
November 7, 1941.

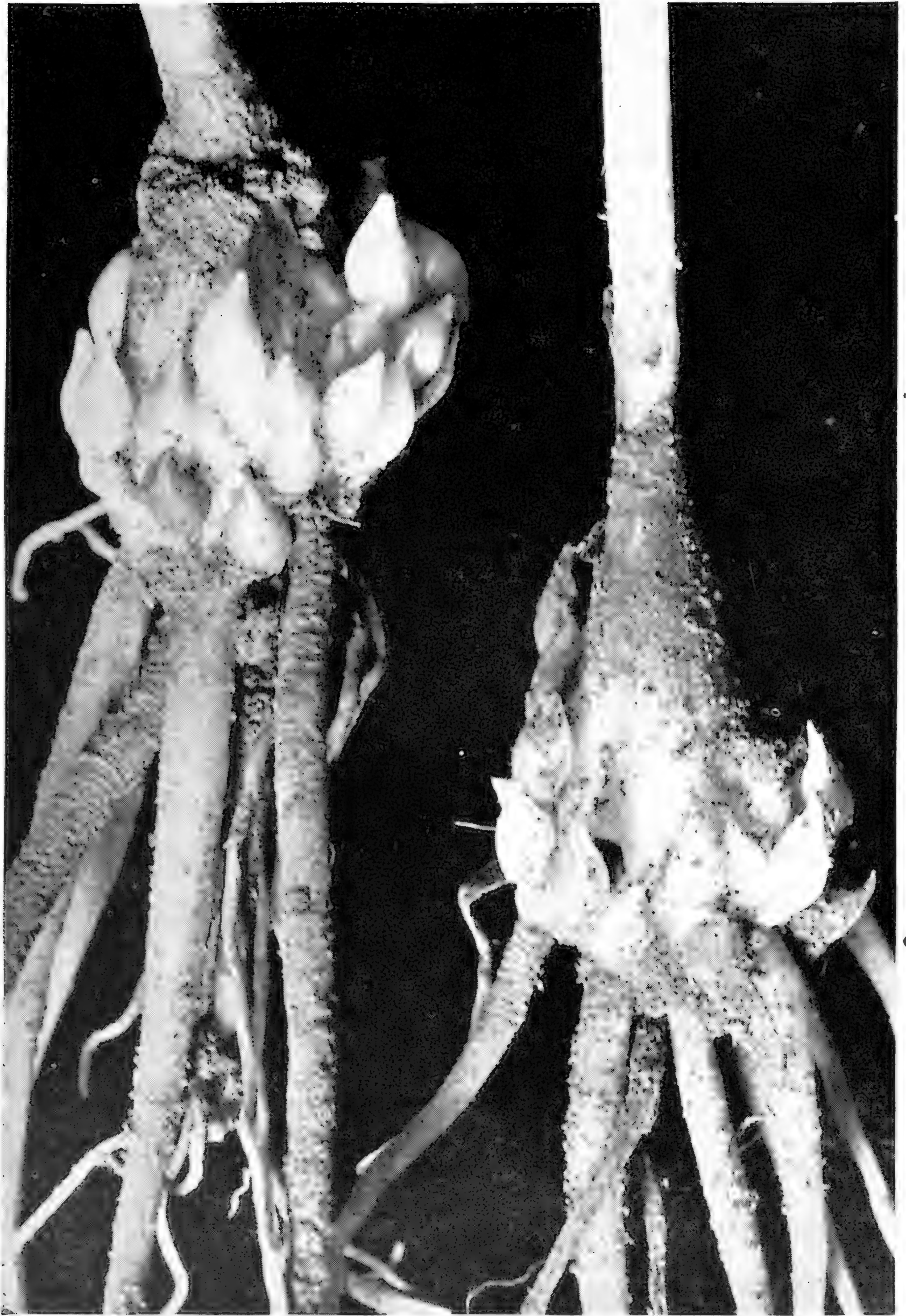
 PROPAGATION OF CLIVIAS BY LEAF CUTTINGS

(*Abstract*). According to V. T eran (Bouturage de Glaieule et de Clivia; Bul. Cercle d'Arboric. de Belg. 1899, page 86), clivias may be propagated by means of leaf cuttings. Apparently in a greenhouse a number of *Clivia* plants had been trimmed and the leaves left on ashes in a bench. Later it was observed that tiny plants had formed at the bases of the leaves.



Kathleen N. Marriage, Colorado Springs, Colo.

The Star Lily, Leucocrinum montanum; upper left, under cultivation; upper right and lower, in its native habitat.



W. M. James, Santa Barbara, Calif.

See page 156.

Nothoscordum inodorum, showing mother bulb and bulblets; X2.
Plate 221



W. M. James, Santa Barbara, Calif.

See page 156.

Clump of Nothoscordum inodorum

Note. *Nothoscordum inodorum* has priority over *N. fragrans*. Readers should make corrections on page 156.

Plate 222

NOTHOSCORDUM FRAGRANS¹W. M. JAMES, *California*

Seeds of *Nothoscordum fragrans* were obtained from an American seedsman in 1931. There seems to be a little uncertainty as to its habitat. In the Bulb Book, John Weathers lists it as North American. Bailey's Cyclopedia of Horticulture lists it as subtropical American. Regardless of where it is native, this bulb has proved that it can be a troublesome pest under California conditions.

No record was kept of the time required for the seedlings to grow to flowering age. After flowering two or three times the bulbs were dug very carefully and discarded. At the present time, almost desperate efforts are still being made to get rid of plants which show up in widely separated places.

One illustration (Plate 221) shows the large number of small bulb-lets which are produced, and all seem to grow under the most trying conditions. The other picture (Plate 222) shows a clump of plants which developed in three or four years after what proved to be a careless attempt to destroy a chance seedling. There are also hundreds of tiny seedling leaves among this group which do not show in the picture. The flowers produce seed very freely which seems to germinate anywhere and everywhere.

Unless it could be used for hybridizing, *Nothoscordum fragrans* seems to have no value whatever in the garden in California. The flowers do have a strong, pleasing fragrance, but they are inconspicuous and its faults offset any desirabilities the plant may have, at least in this locality.

HAEMANTHUS KATHERINAE

W. M. JAMES, *California*

Haemanthus Katherinae is from the edge of the tropics in the Province of Natal, South Africa, where there is summer rain and winter drouth. The light green leaves are 6 to 9 inches across and as much as 3 feet long, narrowing into a comparatively short, spotted sheathing stalk. The bright, orange red flowers are in a close umbel 6 to 10 inches in diameter on a 3 to 4 foot stalk. These measurements are larger than those given in most reference works. They were taken on plants grown in Santa Barbara from seeds imported from South Africa. On six umbels which were counted, the number of flowers varied from 77 to 154, with an average of 109. In Santa Barbara it is almost evergreen,

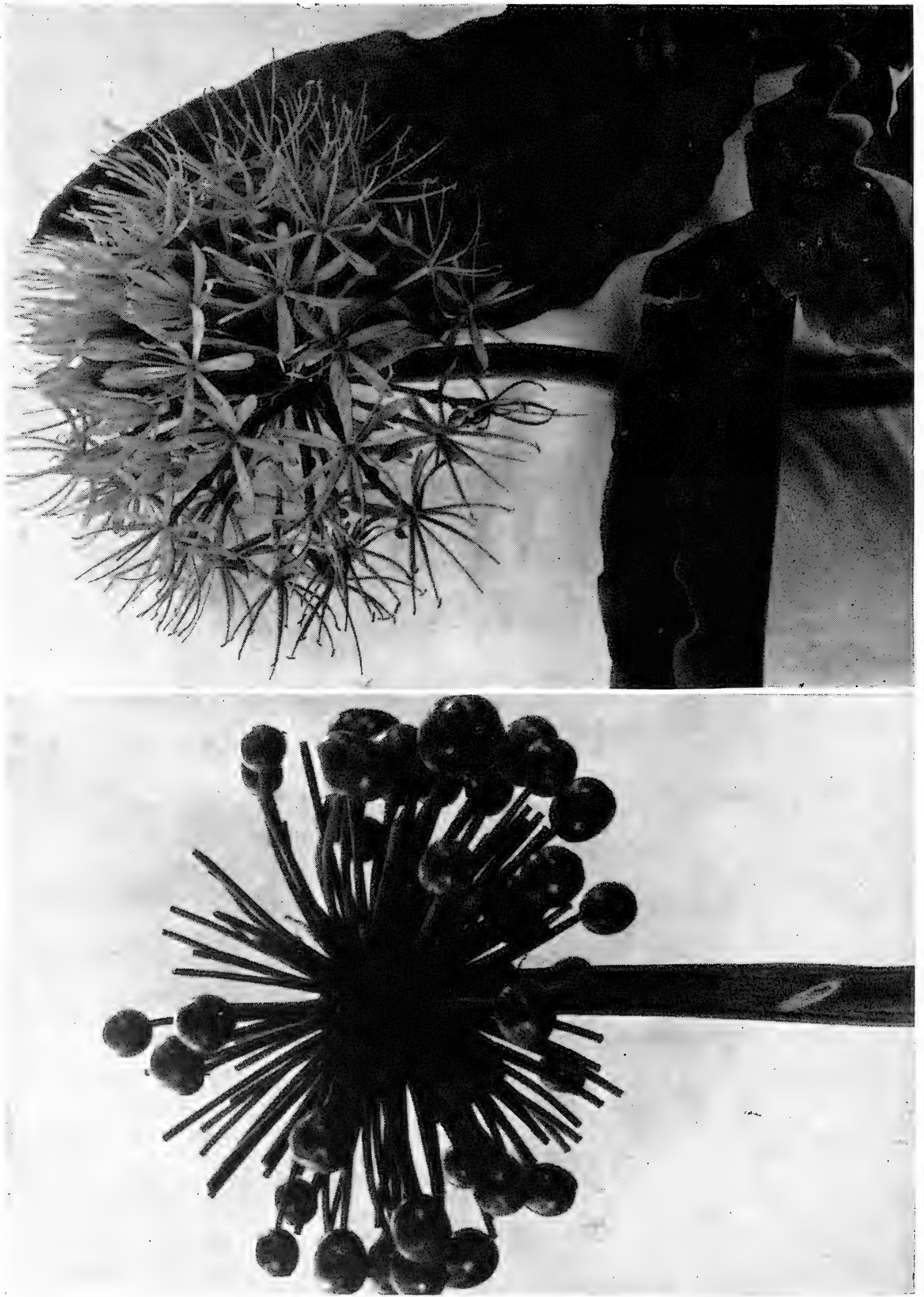
¹ Editors Note—It is suggested that others report also on this species. *Nothoscordum bivalve* has proved to be a charming pot plant, but is a weak grower. Hybrids between it and *N. fragrans* would most likely be worth while. See article by Wyndham Hayward, *Herbertia* 4: 235-236, 1937.

The chromosomes of *N. fragrans* are relatively large—the longest are 23 microns in length. For classroom study and for use as a test object by the scientist, the species has distinct value. —Hamilton P. Traub.



W. M. James, Santa Barbara, Calif.

Haemanthus Katherinae; row of plants viewed from above.
Plate 223



W. M. James, Santa Barbara, Calif.

Haemanthus Katherinae; left, umbel showing fruits; right, close up of inflorescence and leaves.

the new foliage breaking through a crack in the leaf stalk near its base and often becoming quite well developed before the old foliage dies. (See Plates 223 and 224.)

Although this *Haemanthus* is practically evergreen, it is not proving difficult to transplant. Last winter the tops and most of the roots were cut from three bulbs in January when the foliage showed no signs of turning yellow. These bulbs were kept in dry storage for three months and were then planted with the rest of the stock, all of which had well developed new leaves. The three bulbs produced flowers about the same as those of the other bulbs, and developed good foliage, although it was only about one-half as large as usual. This should indicate that seed stores and nurserymen will have little difficulty in handling these bulbs.

Haemanthus Katherinae apparently prefers to grow in fairly dense shade, and a sandy loam soil with plenty of leaf mold. It will probably stand only light frosts. This plant was introduced to cultivation in 1877 and should be better known at the present time, as it is not difficult to grow and has a beautiful and striking appearance either in pots or in the garden.

EARLY RECORDS OF AMARYLLIDS IN CALIFORNIA

H. M. BUTTERFIELD, *Specialist*

Agricultural Extension Service, University of California

Sometime ago I was asked to supply an article for "HERBERTIA" on the early records of Amaryllids in California. I hesitate to write any extensive article on this general subject of *Amaryllis* and related bulbs, because I do not claim to be an authority on this subject. About all I can do is to refer to certain listings. Whether or not the bulbs listed can be identified accurately today is a question which can not be completely answered, although in most cases I believe that we know fairly well what the bulb listed is.

It is practically impossible at this time to say much about the origin of the Cape Belladonna lilies (*Callicore rosea*) imported into California before 1850. One story goes that the daughter of the first governor of California living in San Jose was given one of these Belladonna lilies by a sea captain who imported the bulb from abroad. This was about 1850.

Colonel J. L. L. F. Warren of Sacramento, an experienced nurseryman who came from Massachusetts in 1849, issued a catalog in 1853 in which he listed *Amaryllis belladonna*, very likely the common Cape Belladonna Lily, *Callicore rosea*, still grown in California. He also listed *Amaryllis braziliensis* or Brazil lily, which may possibly be *Eucharis grandiflora*. His *Amaryllis formosissima* or Jacobean Lily is now referred to as *Sprekelia formosissima*. *Amaryllis Johnsonia*, which he described as scarlet and white, is doubtless the hybrid *Amaryllis*, clone *Johnsonii*, known in his day as *Hippeastrum Johnsoni* (= *Amaryllis Johnsoni*).

William C. Walker of San Francisco simply listed *Amaryllis* without specifying what kind he had. He also listed *Sprekelia formosissima*. This was in 1858. Perhaps the most notable early nurseryman specializing in bulbs here in central California was Stephen Nolan who had a nursery in Oakland on Telegraph Road about where 34th Street has been cut through. In attempting to trace back the origin of these bulbs it is very important that we know something about the man who operated the nursery because this may give some insight as to sources from which he secured his bulbs. William C. Walker lived for a time in the southern states before coming to California in 1849 and I doubt if he would be so likely to secure interesting bulbs as Stephen Nolan. Stephen Nolan was born in the Island of Jersey, served his apprenticeship in English gardens and came to California by way of Australia. He had a wealth of experience and was familiar with the leading bulbs grown in California from 1850 to 1860. In his catalogue for 1871 which is the only catalogue of his I have seen, he listed the following bulbs and I will list them as he gave them even though we know now some should be listed under different species and some of them we list under other genera.

- Amaryllis aulica* (*Amaryllis aulica*)
- Amaryllis belladonna* (*Callicore rosea*)
- Amaryllis Coccinea* (*Haemanthus coccinea*)
- Amaryllis corusca* (*Nerine corusca*)
- Amaryllis fothergilli* (*Nerine Fothergilli*)
- Amaryllis johnsonii* (*Amaryllis Johnsonii*)
- Amaryllis longiflora alba* (*Crinum?*)
- Amaryllis longiflora rosea* (*Crinum?*)
- Amaryllis spectabilis* (*Callicore spectabilis tricolor*)
- Amaryllis bicolor* (*Callicore bicolor?*)
- Amaryllis pallida* (*Callicore pallida*)

The reader will at once note that some of these bulbs just listed are not considered *Amaryllis* at the present time. This is due to the fact that all have been segregated as separate new genera leaving in *Amaryllis* Linn. only one group with *Amaryllis belladonna* Linn (Syn. *Hippeastrum equestre* Herbert) as the type. See Uphof's article in 1938 HERBERTIA for details. In most cases we know fairly well what flowers he offered for sale. I might also add that Mr. Nolan listed *Crinum amabile*, *Lycoris aurea*, and *Vallota purpurea*, now usually listed a *V. speciosa*. He also listed *Sprekelia formosissima*, *Nerine flexuosa*, *N. sarniensis* and *Pancratium*. The "*Amaryllis*" were listed from \$1 up to \$2.50 in 1871. I am inclined to believe that this was per bulb since he specifically stated in other cases the price was for a dozen. Mr. Nolan had the longest list of bulbs of any of the early nurserymen that I have a record of. He continued in business until 1879 and has been credited with having had the best bulb collection on the Pacific coast in his day.

James Hutchison, early nurseryman of Oakland, also listed certain amaryllids. I have seen his catalogs for 1874 and 1878 in which he included Vallota at 50 cents to one dollar each. He also listed what he called *Amaryllis lutea* at 75 cents, and now properly known as *Sternbergia lutea*. The Atamosco Lily, which he listed at 50 cents each, is now known as *Zephyranthes atamosco*. A white-flowered form of the Zephyr Lily was listed by him at 75 cents each. This is probably *Z. candida*.

These four nurserymen just listed would likely account for most of the bulbs distributed in San Francisco, Oakland and Sacramento, in early days. However, there were still other dealers who occasionally imported bulbs and sold these in San Francisco either at auction or in small lots, advertising these from time to time in the "California Farmer." As first stated, it is almost impossible for us to fully determine the nature of these different bulbs at the present time even though we may know the name under which they were listed.

The amaryllis and its relatives have found a congenial home in California during a period of about 90 years and popularity is increasing. Growers of the present day should profit by the experience of early pioneers, as brought out in these early records. We may also hope that future generations will look back to the important work which many present-day enthusiasts are carrying on with amaryllids.

STINSON AND HIS ALSTROEMERIAS

L. S. HANNIBAL, *California*

Until recently the writer had casually associated *Alstroemeria* with sub-tropical plants; this probably being due to the fact that several of our best known forms come from Brazil. However, during a recent trip up the Pacific coast to Vancouver a stop was made at Seattle, where Mr. H. L. Stinson showed us what actually could be done. I believe he has some 23 named forms, both species and hybrids, and practically all were in bloom. But the pleasant surprise was that actually many of the types were far better suited to the mild summer climate of Seattle than one would suppose. In fact, the growth of all the hardy types exceeds any ever observed in the San Francisco Bay area, or in southern California, bar none. The largest and best display was made by the *A. chilensis* and *Ligtu-Angustifolia* forms which stood on scapes 4 or more feet high with umbels from 12 to 18" in diameter. The flowers were large and the color variations presented a bright kaleidoscope ranging from the light pastel shades into numerous rich yellow, orange, pink and red tones. As a unit, the mass color effect banked by a background of tall evergreen trees was indeed one not to be soon forgotten.

Questions concerning this wide range of color can be explained on the basis that a number of the so called species are normally quite variable both in color and form, and that many also readily interbreed. The largest group which intercross includes *A. Haemantha*, *A. Chilensis*, *A. Ligtu-Angustifolia*, *A. versicolor*, and probably several lesser known

forms. Seedlings of a number of crosses were apparently present in Mr. Stinson's garden giving rise to many beautiful plants—any of which would be a treasure for a flower lover's garden.

This feature of ready interbreeding also exists in the wild. As one travels from one district to another in South America one form of *Alstroemeria* will often progressively intergrade into another. A number of the so-called species are apparently only varieties. This condition makes classification quite difficult and highly perplexing, for often a described species cannot be relocated in the wild—only near types can be found.

As indicated above not all *Alstroemeria* species will hybridize, several subgenera exist—one perhaps including the above forms. Another consisting of a semi-evergreen group which is represented by *A. aurantiaca* (also known as *A. revoluta*) and its hardy orange form *A. a. major*. A wide range of color extending from light yellow to deep orange is possible wherever these two cross. A double form also exists.

A. psittacina (syn. *pulchella*) is a representative from another group. In some respects this species is more nearly allied to *Bomarea*, having a chromosome count of 9, instead of 8 which is normal for most of *Alstroemeria*. The dark red flowers with their green tips, which are more exotic than attractive, also remind one of some of the *Bomarea* species. The *A. inodora* (USDA#28871) which was released to our Society several years back apparently is a variation of *A. psittacina*. The same applies to *A. brasiliensis*, a wine-red form.

An interesting single flowered type is represented by the low growing, but beautifully marked, *A. pelegrina*. This species and its forms resist cold weather and Mr. Stinson has not had much success with it. However, it is well adapted to the dryer areas of southern California where it is quite popular as it spreads quite rapidly and never fails to bloom.

Since visiting Mr. Stinson a discussion has been raised regarding the general horticultural possibilities of *Alstroemeria* in the United States. The following discussion is a brief summary of the observations of several members of the *Alstroemeria* Committee, who hope it may be of value to the members of the Society and also to others. The problem of greatest concern undoubtedly is just how hardy the various species and forms are. Excluding *A. pelegrina*, all of the types mentioned above can stand some freezing, and apparently occasional winter snows or cold spells cause no harm if frost does not penetrate to the root level. Some later observations of *A. Aurantiaca* growing in an open garden in Victoria, B. C. seemingly verify this. According to Major Pam (Herbertia 1940, page 41) several *Alstroemeria* species survived a freeze of -2 F in the open during the cold spell experienced in England in the winter of 1939-40. On checking over Herbert's *Amaryllidaceae* (1837, page 102) it is also apparent that several species are definitely classed as alpine. However, not all *Alstromeria* species are of this character. Notably, *A. pelegrina* objects to frosty ground, and *A. violacea*, (Brydon, Herbertia, 1940, page 204), a very beautiful species with large dark

violet-blue flowers, is very sensitive to the slightest frost. The latter even required greenhouse protection in the nearly frost free area about San Francisco Bay. Unless hardy hybrids of *Violacea* can be developed, (so far apparently impossible), this plant will have little garden value.

Of all the alstroemerias in cultivation, *A. psittacina* is apparently one of the most versatile plants known. It thrives in warm climates as well as the cold. Mr. Hayward reports that it is the only one that grows satisfactorily in central Florida of those tested up to the present. This is of interest since there are not many plants which tolerate such a wide divergence of climatic conditions. Apparently the forms of *A. chilensis* and *A. Ligtu-angustifolia* are not so versatile, they grow well in some citrus areas, but the Florida summer rains are objectionable as these plants require a near dry rest soon after blooming. The nearly evergreen *A. psittacina* and *A. aurantiaca* are perhaps the best adapted to the citrus areas of the East coast. However, Mr. Ruckman reports that the *A. chilensis* and *A. ligtu* forms do quite well in New Jersey. We can expect good growth there since in this area the late summers are quite dry and the plants can go into their required dormant rest period shortly after blooming. Unfortunately for *A. pelegrina*, Eastern conditions are anything but satisfactory, and unless its special requirements are met with, it will not last long. It is a plant best suited to regions of warm dry summers.

The two common groups, "Aurantiaca" and "Chilensis—Ligtu-Angustifolia", give the most promise of becoming garden favorites. The members of the "Aurantiaca" group do best in a natural setting, and in mild climates bloom several times a year. The numerous members of the "Chilensis" group are better suited to a semi-formal bed. The variety of forms gives many possibilities in breeding for color and size. Those having *A. versicolor* blood are often only a few inches high and make excellent low border plants for early summer bloom. *A. haemantha* hybrids are yellow to orange-red, and 3 to 4 feet high, while the *Ligtu-Angustifolia* strains are best known for their large umbels showing pastel shades of pink and rose-red. With careful breeding of the latter even white flowering forms have been produced, but for some reason the flowers and umbels are smaller and the plants lack vigor.

In warm areas the blooming period of most *Alstroemeria* species is short, lasting some six or eight weeks during the months of May and June. But in cooler areas such as Seattle or Pennsylvania we can expect an extended flowering season beginning in late June and lasting through the mid summer.

Soil conditions are not critical in the case of *Alstroemeria*. A moist well-drained sandy loam is desirable, but a number of species thrive in deeply mulched clay loams. Full sun is desirable in the Northern areas mentioned, but part shade is very essential in central and southern California, and the same apparently applies to the East coast citrus areas.

The seeds germinate best in a sandy loam containing ample humus or peat. If the seed flat is kept near 45° F during the winter nearly all

seeds will sprout in the spring as temperatures approach 55° to 60° F. The plants often bloom the first year, but the best display is had with full growth which often takes several years.

One year old plants preferably grown in sunken pots are best suited for transplanting or shipment. In this case the root system is small and compact and does not break up as readily as in the larger clumps. In frost free areas planting of the dormant root clumps is advisable in the fall; in colder regions the most favorable time is apparently the early spring directly after the ground thaws. So far as known the plants are free of pests, and with the exception that mice eat the roots, seldom have cause to die out.

With regard to inquiries regarding Mr. Stinson, one could best place him by saying he has much in common with a well known friend of his—i.e., Harry R. O'Brien, the "Plain Dirt Gardener". Apparently the rose bug which bit O'Brien passed Mr. Stinson by. He succumbed to the *Amaryllis* bug. Unfortunately Seattle climatic conditions are anything but favorable for a malady of this sort; during the winter for hot house culture is the only solution. Perhaps it was the need of more space (the greenhouse being packed three deep), or the quest for hardier material, that shifted Mr. Stinson's interest to *Alstroemeria*—at least from his earlier accounts in *Herbertia* we know he began in earnest. To assemble the number of species and forms he now has required a great deal of active effort on his part—contacting domestic and foreign seed firms, botanists, missionaries, and other parties, often with disappointing results. But his results are well worth his patience. For at present the many plants occupy a large bed situated on the South-eastern slope of a rolling hill. Conifers bound the open glade and the native ferns, which are a persistent pest in that country, mingle with the alstroemerias adding beauty to the garden, but making weeding a full time summer job for all the family.

In addition to collecting and breeding, Mr. Stinson has also been making translations and copies of material published on *Alstroemeria*. This also has had its problems. Some of the obscure early Latin publications have been difficult to locate and copies are not easy to obtain. The work is nearing completion, but there is still much to be done. The task has been far greater than anticipated. Unquestionably too much credit cannot be given Mr. Stinson and family for their untiring efforts in this very interesting study. May success be with them.

AMARYLLIDS IN PALM BEACH GARDENS

KARL J. EASTON, *Florida*

Palm Beach, Florida, the Mecca of American and International Society, is an island extending along the Atlantic Ocean and between a body of water known as Lake Worth (part of the Inland Waterways) which separates the Town of Palm Beach from West Palm Beach. The latter being the business and industrial center of the Palm Beach County area.

The society resort is exclusive, expensive and beautiful beyond the average person's realization. Its homes are surrounded by high, vine covered, cement or brick walls; and within their confines one finds a garden paradise that only "Mother Nature" can provide; of course along with this there is a tireless effort in care and cultivation with an expenditure of considerable money for the specimen plantings.

The amaryllids are found to some extent, especially those of decorative value, or any that bloom during the winter period. The Palm Beach season is short, lasting from December to April and estate owners plant those blooming during that period. This naturally excludes many of the most beautiful within the amaryllid classification, that would be used if owners were here during their time of blooming.

Those amaryllids used must be specimens, well grown and if expensive so much the better. One Palm Beach resident a few years back used *Clivia* as a walk border, which caused considerable comment—it was an expensive planting. *Clivias* here, unless shaded and well cared for, do not do as well as in California.

Nearly every Palm Beach Patio has *Strelitzia reginae*, the Bird of Paradise flower, and of course its cousins the banana. They are used around shady pools, walks, yards, corners, or shady nooks festooned with flame vines and *Bougainvillea*. Grouped about lily pools the Shell Lily of the ginger group is used. The fancy leaved caladiums in most every color and combination are used to lend color and are grouped among other plantings as edgings. *Crinum*, the larger decorative species, are welcomed. *Hymenocallis*, the Spider Lily, are group planted here and there, doing well almost any place. The calla in the yellows and whites are most favored by estate owners, especially edged with flowering begonias. The hybrid *Amaryllis* is gradually growing in favor, especially with the Palm Beacher who stays on and spends the late spring in his or her Southern home.

Amaryllis equestre grows like a weed and sometimes blooms very early. They are liked for that and it is a favorite in yard planting with those who admire its rich orange bloom with yellow center. A few of the liliiums are grown, the Philippine Lily (*Lilium formosanum*) and the Easter Lily (*Lilium longiflorum*). The former doing best in moist, well drained borders where they are tucked back against a wall among other shrubs. Its long stems and foliage are most attractive and lend a fragrance to the garden comparable with the finest varieties grown in Northern gardens. Here little attention is necessary in the culture of the Philippine Lily, while the Easter Lily demands a sunny to semi-shady location in rich soil with not so much moisture.

Rain Lilies are appearing more and more in plantings, and are used mostly for their attractive foliage in edgings along flag stones, walks and the Patio. *Zephyranthes grandiflora* and *Z. rosea* are mostly found with *Z. citrina*, *Z. ajax*, and *Habranthus robusta* in the next places for honors.

In estate "half-shades" and greenhouses one usually finds orchids for the orchid has always been the aristocratic flowering plant. They tell me that orchids are going to be a house plant within a few years as

the price is going down and the culture is better understood. Among the amaryllids so treated *Eucharis* takes first place. Every owner has them and usually they are finely grown and along with the callas are probably the most favored in the average Palm Beach home. Occasionally an owner, if especially interested in the amaryllids, grows *Haemanthus*, and *Agapanthus*.

Palm Beach gardens are generally elaborately planned and constructed and well cared for. The greenhouses and "half-shades" are built to blend in with the grounds and buildings of the estate. Each estate has its gardener or caretaker. If a caretaker, he must understand plants and plantings as from year to year much changing around takes place.

Each owner wants the finest of plants and flowers and usually has them. To see Palm Beach from the inside horticulturally is much more interesting than the imposing exclusiveness one senses when passing along in front of the villa. Of course, one must know either the owner, gardener or caretaker to even get a look.

HARDY AMARYLLIS

HAMILTON P. TRAUB, *Maryland*

In the late summer of 1940, a number of large bulbs of *Amaryllis advena*, of the pink and ox-blood red varieties, were planted out of doors at Beltsville, Maryland in gravelly clay soil. These plants bloomed profusely soon after planting and later produced foliage. The bulbs had been secured several years ago from Rev. C. W. Hall of Austin, Texas, and had thrived and bloomed annually for a number of years at Mira Flores, Orlando, Florida.

As a hardiness test these bulbs were left out of doors through the winter of 1940-41. Inspections at various times during the winter and spring showed that the foliage remained green and was not injured although the temperature dropped to —4 degrees F. (= —20 degrees C.). This would indicate that perhaps others of the reported 40 species of the linear-leaved, small-flowered *Amaryllis* may prove hardy in the upper South and even farther North. How far north this limit might be can only be determined by extensive experiments. This would be a particularly interesting field for the members of the Society living in the South and less extreme North. There are both spring and fall flowering species, and a great many color variations—yellow, pink, scarlet, vermilion, pomegranate red, purple, violet-purple and bi-colors: white with red, yellow with red and yellow with orange, as shown in Table 1.

Table 1 is incomplete in some particulars mainly due to the habit of a certain type of herbarium taxonomist who cares little for such details as time of leaf and flower appearance. These details are usually omitted in the Latin diagnosis and thus do not appear in the translated descriptions. Information leading to the completion of the table is urgently needed and should be reported in HERBERTIA.

As to blooming season there are spring, summer and fall flowering species. In many species the foliage is contemporaneous with the flowers. The group presents a veritable challenge to the plant breeder.

TABLE 1. Color, flowering season, time of foliage appearance and habitat of the linear-leaved, small-flowered *Amaryllis* species.

Species	Habitat	Color	Time of Flowering ¹	Time of Foliage appearance
<i>Amaryllis Jamesonii</i>	Argent.	red	fall	?
<i>Amaryllis Bertroana</i>	Chile	purple	July	?
<i>Amaryllis Bagnoldii</i>	Chile	yellow, tinged red	?	?
<i>Amaryllis bifida</i>	Argent.	bright red	fall	n.c.w.f. ²
<i>Amaryllis advena</i>	Chile	yellow or red	fall	n.c.w.f
<i>Amaryllis pulchra</i>	Argent.	?	?	?
<i>Amaryllis marginata</i>	Argent.	?	?	?
<i>Amaryllis ananuca</i>	Chile	deep lemon; veins red	?	c.w.f. ³
<i>Amaryllis consobriniana</i>	Chile	scarlet & yellow	?	?
<i>Amaryllis Moelleri</i>	Chile	rose red, white base	?	c.w.f.
<i>Amaryllis lineata</i>	Chile	yellow, marked red	fall	?
<i>Amaryllis rosea</i>	Chile	bright red	summer	c.w.f.
<i>Amaryllis chilensis</i>	Chile	red or yellow	spring	c.w.f.
<i>Amaryllis soratensis</i>	Boliv.	?	fall	?
<i>Amaryllis andicola</i>	Chile	bright violet	July	?
<i>Amaryllis splendens</i>	Chile	yellow & vermilion		
		orange	?	?
<i>Amaryllis flava</i>	Chile	yellow	?	?
<i>Amaryllis purpurata</i>	Chile	purple	?	c.w.f.
<i>Amaryllis montana</i>	Chile	yellow	?	?
<i>Amaryllis pratensis</i>	Chile	bright red	?	c.w.f.
<i>Amaryllis atacamensis</i>	Chile	violet-purple	?	?
<i>Amaryllis Bakeri</i>	Chile	yellow	?	c.w.f.
<i>Amaryllis uniflora</i>	Chile	red	?	n.c.w.f
<i>Amaryllis rhodolirion</i>	Chile	bright red	?	n.c.w.f
<i>Amaryllis modesta</i>	Chile	white, red keel	?	n.c.w.f
<i>Amaryllis araucana</i>	Chile	rose	?	c.w.f.
<i>Amaryllis coloniana</i>	Chile	red & yellow	spring	c.w.f.
<i>Amaryllis Popetana</i>	Chile	pink	summer	?
<i>Amaryllis gladioloides</i>	Argent.	red	summer	?
<i>Amaryllis granatiflora</i>	Uruguay	pomgranate red	?	?
<i>Amaryllis bonariensis</i>	Argent.	purple	?	?
<i>Amaryllis Gayana</i>	Argent.	purple	?	?
<i>Amaryllis Herbertii</i>	Chile	bright red	?	c.w.f.
<i>Amaryllis Elwesii</i>	Argent.	yellow & red	fall	c.w.f.
<i>Amaryllis tenuiflora</i>	Chile	?	?	?
<i>Amaryllis Philippiana</i>	Chile	scarlet	?	?
<i>Amaryllis laeta</i>	Chile	scarlet	?	?
<i>Amaryllis fulgens</i>	Chile	scarlet, tube yellow	spring	?
<i>Amaryllis bicolor</i>	Chile	red & yellowish-green	spring	c.w.f.
<i>Amaryllis phycelloides</i>	Chile	red & yellow	?	c.w.f.

¹ For northern hemisphere.
² Not contemporaneous with the flowers.
³ Contemporaneous with the flowers.

This note is written in the hope that the members of the Society in the South and North will take these promising subjects under their wings. *The very great need is for the introduction of species.* At present there are only two or three species that are usually met with—*Amaryllis advena*, and *A. pratensis*, and possibly *A. bicolor*. Those who have had success with this charming subject should report in HERBERTIA.

CRINUM SCABRUM

WYNDHAM HAYWARD, *Florida*

The illustration of *Crinum scabrum* (Figure 69) shows the somewhat spectacular nature of this flower. The bloom comes in the "Milk and Wine Lily" group of crinums, so common in old Florida gardens and country yards. The bulb is large, and may weigh several pounds in big specimens. It grows in medium light upland soil as well as the heavier types. The blooms come in late spring and early summer in



Fig. 69. *Crinum scabrum*; photo by Wyndham Hayward.

Florida, and are several to many in an umbel, a foot or slightly more tall. The foliage of this species is more or less deciduous in Florida being very tender to frost, but the bulb remains uninjured, and grows thriftily after warm weather comes again. The bulb itself has brown scales, and is nearly round in shape, with a short "bull-necked" appearance. The species seeds well, and should be of value in hybridizing. The plant pictured came from the gardens of the late T. L. Mead of Oviedo, Fla., during his lifetime.

7. THE SOCIETY'S PROGRESS *

SECRETARY'S MAIL BAG

From Perry Coppens of Flanders Farm, Milford, N. J., comes a handsome photograph of a plant of *Cybistetes longifolia* (= *Ammocharis falcata*) in bloom. It shows a very attractive close-set umbel of flowers in spectacular array atop a short stem. The leaves are typically sickle-shaped as in this group. We hope this photograph can be reproduced for the benefit of all readers of HERBERTIA in the next issue.

In the September 1941 issue of "Nature Garden Guide," a bi-monthly publication of the School Garden Association of New York, there is an extended reference to *Amaryllis* under the topic, "Bulb Culture for Schools." The item includes simple directions for culture, and the statement that "the School Garden Association recommends the *Amaryllis* for teachers' use."

Nowhere in Florida had there ever been seen, and probably never in the entire southeast before, such a display of the new Daffodil hybrids as that shipped by air mail to the National Amaryllis Show in Florida last spring, by the Oregon Bulb Farms, Sandy, Ore., Jan de Graaff, president. They were a veritable revelation of the progress being made in the development of this popular flower. The marvel of the exhibit was the fresh, beautiful texture of the flowers after their 3,000-mile air express journey in a box.

Dr. Liberty Hyde Bailey, an old friend of the American Amaryllis Society, was kind enough this year to write a few words of greeting for the readers of 1941 HERBERTIA, which appear in the forepart of this volume. Dr. Bailey said he would have written more, but that he was packing to make another extended trip out of the country on his palm botany explorations. His zeal and enthusiasm for the great worlds of plant science and horticulture at his advanced age, is an inspiration to many younger horticulturists who sometimes find their hopes and courage dimming these days.

Lycoris aurea, the St. Augustine "Hurricane Lily," appeared on the New York florists wholesale market in early fall of 1941, the spikes of beautiful golden flowers being priced at about 50 cents each, which means that retail buyers paid a dollar or more. Not a bad profit from bulbs which have sold at about a dollar each when they were available. Recently, however, large bulbs have become scarce, due to the popular demand for this interesting subject. They will probably see a sharp rise in price for a few years. John R. Heist of St. Augustine reports that a friend of his experimented with the flowers this season and was

* The material in this section was prepared by the wide awake Secretary of the Society, Mr. Wyndham Hayward. The Society has been most fortunate in being guided through its infancy and now to a robust coming of age by the brilliant and unselfish Secretary whose interest and enthusiasm never lag. We all owe him a very great debt of gratitude for a very difficult task exceedingly well done.—Hamilton P. Traub.

more than moderately successful in shipping the blooms as far as New York. This bulb is a highly desirable item, and a good investment, in gardens of the deep South, too.

Mr. Heist also reports that some of his *Callicore rosea* (Amaryllis Belladonna, Herb.) bloomed this season in Florida, a most unusual thing. Out of hundreds of bulbs of this plant grown in Florida only one or two have ever bloomed after the first year, in the writer's experience.

Dr. H. Harold Hume of Gainesville, Fla., the dean of Zephyranthes enthusiasts, advises us he has just about finished the compilation of material for the treatment of the Mexican species in this delightful genus, which will form another interesting section for some future issue of HERBERTIA. Dr. Hume, as dean of the College of Agriculture at the University of Florida, is a very busy man, and does not have all the time he would like to spare for his monographic work. And there are so many species of Zephyranthes.

Articles for the English section of HERBERTIA this year traveled by Trans-Atlantic Clipper air mail to the United States in duplicate for absolute safety. A number of letters have been lost in recent times by the Society's officers in the mails between Europe and America, which can only be accounted for through "enemy action."

Herman Brown, orchardist and Amaryllis fancier of Gilroy, Calif., sends us some clippings from the San Jose (Calif.) Mercury Herald with an account of the "open house" given by Mr. Brown at his Amaryllis farm last April, attended by thousands of flower lovers. The piece is illustrated with a photograph of Mr. Brown with some of his choice blooms. Mr. Brown is particularly proud of some pure white Amaryllis he was fortunate enough to import from Holland just before the present war.

Major Albert Pam, our English Corresponding Member, calls our attention to the "very interesting account of the genus *Hemerocallis*, and list of species, published by G. P. Baker in the Journal of the Royal Horticultural Society in 1937." He adds, "I do not think that you could find a better account or get anyone to improve on it."

Sir Arthur W. Hill, director of the famous Kew Gardens, near London, England, died in a "riding accident" in England in November 1941, according to advices reaching the United States. Sir Arthur was a plant scientist of world renown, and a helpful correspondent and adviser of the American Amaryllis Society on various occasions since its organization. He wrote the introduction to the 1937 HERBERTIA, the issue commemorating the 100th anniversary of William Herbert's "Amaryllidaceae." In his death the world of plants and gardens suffers a loss that will be deeply felt. The Society has often benefited by his courtesies.

Major Pam reports that a large part of his noted plant and bulb collection under glass was damaged or destroyed by bombs, a German plane dropping a large one right on the greenhouses at his country estate "Wormley Bury," in Herefordshire. His staff of gardeners has been reduced by the war from ten or twelve to the head gardener and daughter, and one young man. Major Pam, despite the loss to his plants, etc., is to be congratulated that his family and servants in his country house only a few hundred feet away escaped harm. The loss experienced by British horticulture in the destruction of a large part of the Pam greenhouse collection is irreparable, and stands as one of the outrages endured by civilized man due to Nazi total war.

Major Pam has promised to compile an interesting article on the color plates and prints of various Amaryllids in the great books and magazines of some 150 years ago, when the color illustrations of flowers were at their classic best in published works. He has a collection of these early botanical and horticultural works in his library, and will make his observations on first hand research.

Arthington Worsley, dean of the Amaryllid fraternity, reports a cold winter at Ventnor, Isle of Wight, where he is now living, for the season 1940-41. He reports himself and family safe so far from German bombs, but bulbs and plants in his garden were frozen back if not killed outright in many instances. He reports *Crinum*s and *Agapanthus* doing well there nevertheless. Because of the food rationing, he has lost several stone in weight, he reports. In his 80th year his horticultural enthusiasm is unabated.

Mrs. J. W. Archbell of Natal, South Africa, writes interestingly of *Tulbaghia*, a rare amaryllid related to *Agapanthus*. This is a novelty in American gardens, although a few California dealers are experimenting with it. The foliage in at least one species has a garlic scent when crushed.

E. P. Killip, associate curator, Division of Plants, Smithsonian Institution, Washington, D. C., reports under recent date that he is still engaged on his monograph of the genus *Bomarea*, and that material is still coming in from Central and South America, much of which represents undescribed species. So at least in *Bomarea* there is still "something new under the sun."

"*Es una bella e interesante revista que leeré con placer,*" writes Dr. R. A. Philippi, of the National Museum of Natural History, Santiago, Chile, in reference to the 1940 HERBERTIA, on receipt of his copy last spring. Dr. Philippi wrote an interesting biography of his noted grandfather, pioneer Chilean Amaryllid botanist, for the previous issue.

The Washington Post of June 15th, 1941 contained an item concerning Peru's "Fiesta de Amancaes," celebrated on St. John's day, June 24, on the outskirts of Lima. It is one of South America's most colorful fiestas, and is held on the Pampas de Amancaes, which is

named for the carpet of yellow flowers of *Ismene Amancaes* which are in bloom there at that time on the plains and hillsides. The celebration lasts a week. If any of the readers of this note have seen this fiesta, we would like to have them send us an account of it. It is a picturesque ceremony honoring one of the most distinctive and beautiful flowers in the Amaryllis Family.

The hybrid *Amaryllis* may now truthfully be said to have "arrived," after decades of enthusiastic promotion, in top gardening society. Mr. Richardson Wright, the eminent editor of the outstanding quality magazine in its field, "House and Garden," writes under date of April 1941 that "I begin to see a definite influence of HERBERTIA among gardeners, more of them are talking about *Amaryllis* just now, and I am putting some in my little greenhouse so that this Fall I can start growing them there in my Connecticut garden."

SECRETARY'S MESSAGE

The World of War has encroached upon the quiet confines of Amaryllid studies in the year since the 1940 HERBERTIA went to press. The Society has lost the active support and participation in its affairs and publications of most of its foreign members, contributions of funds, dues and material for the yearbook have been cut off from abroad, and the gardens of two of its leading members in England have actually been bombed destructively by German war planes.

The work of the Society has been carried on in the difficult atmosphere of "total defense," or active military procedure. Members and contributors to former issues of HERBERTIA are serving with armed forces of the United States, the British Empire, and possibly other powers. The interest in Amaryllids has assumed a more important place in the minds of men, as a matter of "morale," a "lift" from sterner cares.

Under this burden of war emergencies, your officers have endeavored to "bear the torch" undimmed to still greater achievements in horticulture and garden beauty. Three flower shows have been sponsored, two in Florida, the National Amaryllis Show in March, and the National Daylily Show in June. These were smaller than usual, but high in quality of material and abounding with the beauty of lovely blooms and the gardening enthusiasm of those participating.

The press of personal and official business outside the hours of personal leisure and recreation which can be devoted to the Society's affairs, has grown heavier in 1941, and slowed the processes of research, experimentation and investigations in the many fields of the Society's interests. Your secretary sends his heartfelt thanks to numerous co-operators and other generous friends of the Society, who have helped to make this eighth annual issue of HERBERTIA possible, and offers his abject apologies for his own inadequacies to the task at hand.

To Dr. Hamilton P. Traub of Beltsville, Md., go his heartfelt thanks for his admirable determination and resolution in tracking down the elusive items of Amaryllid lore, and his patience with the delays of

correspondence and business affairs which seem unavoidable in these hectic times. Mr. R. W. Wheeler of Winter Park, Florida, treasurer of the Society, has rendered noble service in the cause of flower shows of the Society, and in managing technical details of business administration. President E. G. Duckworth remains a source of quiet inspiration for sound workmanship and unflagging enthusiasm.

Mr. W. M. James of Ojai, Calif., deserves a special bouquet of words for his continued labors in behalf of the Society and cheerful cooperation. Mr. Harry L. Stinson, Seattle, Wash., Mr. L. S. Hannibal, Concord, Calif., Major Albert Pam, and Mr. Amos Perry, of England, Dr. V. T. Stoutemyer, Greenbelt, Md., Mr. Elmer A. Claar, Chicago, Ill., Prof. E. L. Lord, Orlando, Fla., Mr. Howard Eric and T. H. Everett, New York, N. Y., Cecil Houdyshel, La Verne, Calif., are others who have lightened the secretary's labors with their aid. There are others, just as deserving, who must remain anonymous for want of space, but to whom your secretary sends his humble blessing.

As in the past, the secretary appeals for your continued support, financially and spiritually, in the Society's affairs. Promote the Society as never before in these difficult days, and with your good will we may emerge from this darkened hour of world travail all the stronger. "Ave," as the Latins said, but let it not be "Vale" yet.

November 1, 1941
Lakemont Gardens
Winter Park, Fla.

WYNDHAM HAYWARD,
Secretary.

REPORT OF TRIAL COLLECTIONS COMMITTEE

The Trial Collections Committee reports the smallest number of accessions during 1941 in the history of the Society for a similar period, this being due mostly to the difficult mail situations, especially in regard to the importation of material from abroad. Mr. W. M. James of Ojai, Calif., a director of the Society is cooperating in the growing and propagation of items in the Society's collections, for ultimate distribution as premiums to members.

Members are urged to remember the Society with sample lots of seeds or rare bulbs of new and unusual amaryllids which they may come upon anywhere.

A-296—Seeds of *Amaryllis ambigua* X *A. johnsonii*, from L. S. Hannibal, Concord, Calif.

A-297—Seeds of *Crinum* sp. from L. S. Hannibal, Concord, Calif.

A-298—Bulb of *Callicore rosea* variety, from L. S. Hannibal, Concord, Calif.

A-299—Bulb of *Crinum* sp., possibly white type of *C. Moorei* from Frank Leach, Piedmont, Calif.

A-300—Seeds of some amaryllid, from Mendoza Province, Argentina, August 1941. Collected by Dr. Alberto Castellanos, in January 1941.

- A-301—Two bulbs of *Amaryllis Alberti* (double flowered form of *A. belladonna* Linn.) from Mrs. W. E. MacArthur, Jacksonville, Fla.
- A-302—Seeds of *Bomarea frondea*, from Colombian Andes, obtained from a collector in exchange. Distributed to several members.
- A-303—Seeds of *Crinum* sp. from Gold Coast, West Africa; collected by Major E. Milne-Redhead of the South African Forces, British Empire Army.
- A-304—Bulbs of *Nerine angustifolia*, from Dr. Dyer, Dept. of Agric. & Forestry, Union of South Africa, Pretoria.
- A-305—Bulbs of *Nerine appendiculata*, from National Botanical Garden, Kirstenbosch, Cape Town, Union of South Africa.
- A-306—Bulbs of *Nerine Masonorum*, from National Botanical Garden, Kirstenbosch, Cape Town, Union of South Africa.
- W. Hayward.

NOTICE OF 1942 NOMINATIONS

To the members of the American Amaryllis Society:

As approved by Article 5, Section 1, of the By-Laws of the American Amaryllis Society, which specifies that the secretary shall send to all voting members not less than 90 days before the date of the annual election, a list of the offices to be filled and the names of those whose terms expire, this information is hereby incorporated in the data below, and same will take the place of a mailed notice to the members to this effect for the 1942 election:—

President	Mr. E. G. Duckworth
Vice-Presidents	Mr. T. H. Everett
	Mr. E. A. McIlhenny
	Mr. Fred H. Howard
Secretary	Mr. Wyndham Hayward
Treasurer	Mr. R. W. Wheeler
Director-at-large for 3 years	Dr. H. P. Traub

Article 7, Section 1 of the Constitution, provides that any voting member may submit to the Secretary, not less than sixty days before the annual meeting, nominations for officers and directors. These shall be submitted to a nominating committee, who shall select the candidates for the final ballot.

The Annual Meeting of the Society in 1942 will be held on the second Wednesday in April, as provided by Article 10, Section 1, of the Constitution, this being April 8, 1942. Therefore the names of nominees must be submitted by the voting members to the Secretary before February 11, 1942.

WYNDHAM HAYWARD,
Secretary.

October 1, 1941,
Winter Park, Florida.

The Secretary would like to take this opportunity of calling to the attention of members again the desirability of adding new members and enlarging the field of the Society by bringing it to the attention of horticulturists and garden lovers everywhere. The 1941 Year Book, we hope, will be considered a notable example of the Society's constant efforts to bring together the latest research, the newest accurate and useful information and interesting illustrations concerning the important Amaryllis family. The income of your Society is used solely for the publishing of its Year Book, the holding of Amaryllis exhibitions, and generally supporting the other worthy aims of the organization.

OFFICERS AND DIRECTORS of the AMERICAN AMARYLLIS SOCIETY

1941-42

PRESIDENT—Mr. E. G. Duckworth, *Orlando, Florida*VICE PRESIDENTS—Mr. T. H. Everett, *New York, N. Y.*Mr. E. A. McIlhenny, *Avery Island, La.*Mr. Fred H. Howard, *Montebello, Calif.*SECRETARY—Mr. Wyndham Hayward, *Winter Park, Florida*TREASURER—Mr. R. W. Wheeler, *Orlando, Florida*DIRECTORS-AT-LARGE—Term expiring in 1942, Dr. H. P. Traub, *Beltsville, Md.*

Term expiring in 1943,

Mr. W. M. James, *Santa Barbara, Calif.*Term expiring in 1944, Mr. Jan de Graaff, *Sandy, Ore.*

EDITOR, HERBERTIA

Dr. Hamilton P. Traub

FELLOWS OF THE SOCIETY

Mr. A. Worsley

(Outstanding work in systematic botany of the Amaryllidaceae)

Miss Ida Luyten

(Original researches in vegetative propagation of Amaryllis)

Prof. Ferdinand Pax

(Outstanding research into the phylogeny of the Amaryllidaceae)

Dr. J. Hutchinson

(Original work on the phylogeny of the Amaryllidaceae)

Mr. Ernest H. Krelage

(Outstanding work in breeding narcissi and other amaryllids)

WILLIAM HERBERT MEDALISTS

Mr. Arthington Worsley, *Ventnor, Isle of Wight, England*Mr. Ernst H. Krelage, *Haarlem, Holland*Mr. Cecil Houdyshel, *La Verne, California*Major Albert Pam, *Wormley Bury, Herts, England*Mr. Pierre S. du Pont, *Wilmington, Delaware*Mr. Jan de Graaff, *Sandy, Oregon*Mr. Fred H. Howard, *Montebello, Calif.*Mr. S. Percy Lancaster, *Alipore, Calcutta, India*Dr. J. Hutchinson, *Kew Gardens, Surrey, England*Mr. Carl Purdy, *Ukiah, Calif.*Dr. A. B. Stout, *New York, N. Y.*Mr. H. W. Pugsley, *Allen's Green, Eng.*Mr. W. M. James, *Ojai, Calif.*

CORRESPONDING MEMBERS

Antilles—Dr. H. C. Gray, *Atkins Institution, Cienfuegos, Cuba*Argentina—Sr. Jose F. Molfino, *Buenos Aires*Australia—Mr. G. K. Cowlshaw, *Mosman, New South Wales*Brazil—Sr. Joao Dierberger, *Sao Paulo*Canada—Mr. John S. Lotan, *Hull, Quebec*Central America—Mr. Alan Kelso, *Punto Arenas, Costa Rica*China—Mr. Puiman-Lee, *Lingnan Univ., Canton, China*England—Major Albert Pam, *Broxbourne, Herts.*

Holland—Mr. Ernst H. Krelage, *Haarlem*
 India—Mr. Syney Percy-Lancaster, *Alipur, Calcutta*
 Kenya Colony, East Africa—The Lady Muriel Jex-Blake, *Nairobi*
 Mexico—Dr. G. Gandara, *Federal Dept. Agric., Mexico City*
 Union of South Africa—Mr. R. A. Dyer, *Pretoria*
 Venezuela—Dr. H. Pittier, *Caracas*.

STANDING COMMITTEES

MEMBERSHIP *Chairman*

Southwest: Mr. Gordon Ainsley, <i>Calif.</i>	North Midland: Mr. Robert Schreiner, <i>Minn.</i>
South Midland: Mr. J. L. Gebert, <i>La.</i>	Northeast: Mr. Robert Wyman, <i>N. Y.</i>
Southeast: Mrs. John H. Churchwell, <i>Fla.</i>	Hawaii: J. Montague Cook, Jr., <i>Honolulu</i>
Northwest: Mr. H. L. Stinson, <i>Wash.</i>	Canada: Mr. John S. Lotan, <i>Quebec</i>

FINANCE AND AUDITING—Mr. E. G. Duckworth, *Chairman*

Mr. Wyndham Hayward	Dr. Hamilton P. Traub
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PUBLICATIONS—Dr. Hamilton P. Traub, *Chairman*

Mr. T. A. Weston	Mr. R. W. Wheeler
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EXHIBITIONS AND AWARDS *Chairman*

Southwest: Mr. Fred H. Howard, <i>Calif.</i>	North Midland: Mr. C. W. Davison, <i>Wisc.</i>
South Midland: Mr. E. A. McIlhenny,	Northeast: Mr. Arno Nehrling, <i>Mass.</i>
Southeast: Mr. R. W. Wheeler, <i>Fla.</i>	Hawaii: J. Montague Cook, Jr., <i>Honolulu</i>
Northwest: Mr. W. L. Fulmer, <i>Wash.</i>	Canada: Mr. J. B. Pettit, <i>Ontario</i>

TRIAL COLLECTIONS—Mr. Wyndham Hayward, *Florida, Chairman*

Southwest: Mr. W. M. James, <i>Calif.</i>	North Midland: Mr. D. A. Humphrey, <i>Minn.</i>
South Midland: Dr. S. H. Yarnell, <i>Texas</i>	Northeast: Mr. Pierre S. du Pont, <i>Del.</i>
Southeast: Mr. A. T. Coith, <i>Fla.</i>	Hawaii: Dr. J. H. Beaumont, <i>Honolulu</i>
Northwest: Mr. H. L. Stinson, <i>Wash.</i>	Canada: Mr. A. E. Challis, <i>Ontario</i>

RESEARCH—Dr. L. H. MacDaniels, *Chairman*

Mr. W. M. James;	Mr. Jan de Graaff;
Dr. Hamilton P. Traub;	

SPECIAL COMMITTEES

NOMENCLATURE AND DESCRIPTION—Dr. Hamilton P. Traub, *Chairman*

Mr. W. M. James	Mr. T. A. Weston
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HEMEROCALLIS (DAYLILY)—Mr. Elmer A. Claar, *Chairman, Wilmette, Ill.*

Mr. Robert Schreiner, <i>Minnesota</i>	Dr. S. H. Yarnell, <i>Texas</i>
Mr. J. Marion Shull, <i>Maryland</i>	Mr. V. T. Stoutemyer, <i>Maryland</i>

HEMEROCALLIS (DAYLILY) JURY FOR EVALUATING DAYLILIES—Dr. L. H. MacDaniels, *Chairman, Cornell University, Ithaca, N. Y.*

Mr. Elmer A. Claar, <i>Illinois</i>	Mr. Robert Schreiner, <i>Minnesota</i>
Prof. John V. Watkins, <i>Florida</i>	Mr. David F. Hall, <i>Illinois</i>
Dr. V. T. Stoutemyer, <i>Maryland</i>	Mr. Donald B. Milliken, <i>California</i>
Prof. Ira S. Nelson, <i>Louisiana</i>	Dr. Hamilton P. Traub, <i>Maryland</i>
Mr. J. Marion Shull, <i>Maryland</i>	Mr. Wyndham Hayward, <i>Florida</i>
Dr. J. S. Cooley, <i>Maryland</i>	Prof. H. B. Dorner, <i>Illinois</i>

(Additional members, up to 20, to be appointed later; those in charge of official test gardens become ex-officio members.)

ALSTROEMERID—Mr. H. L. Stinson, *Chairman, Seattle, Wash.*

Mr. Wm. James, <i>California</i>	Mr. John F. Ruckman, <i>Pennsylvania</i>
Mr. L. S. Hannibal, <i>California</i>	

PANCRAIDEAE—Mr. L. S. Hannibal, *Chairman*

PUBLICATIONS OF THE AMERICAN AMARYLLIS SOCIETY

A complete file of *HERBERTIA*, the year book of the American Amaryllis Society, is indispensable to all who are interested in Amaryllids. A limited number of copies of the following are still available:—

VOLUME 1 (1934). Containing the biography of Henry Nehrling, and many valuable articles on amaryllids; with a portrait of Henry Nehrling and 16 other illustrations; a total of 101 pages.

VOLUME 2 (1935). Containing the autobiography of Theodore L. Mead, and many excellent articles on varieties, breeding, propagation, and culture of amaryllids; with portraits of Theodore L. Mead and David Griffith and 18 other illustrations; a total of 151 pages.

VOLUME 3 (1936). Containing the autobiography of Arthington Worsley, and important articles on description, genetics and breeding, physiology of reproduction, and amaryllid culture; with 3 portraits of Arthington Worsley, one color plate and 30 other illustrations; a total of 151 pages.

VOLUME 4 (1937). Containing the biography of William Herbert; the reprint of Herbert's essay, on Crosses and Hybrid Intermixtures in Vegetables; Dr. Darlington's essay, The Early Hybridizers and the Origins of Genetics, and many important articles on description; cytology, genetics and breeding; physiology of reproduction, and amaryllid culture; with two portraits, forty-four other plates and three figures; a total of 280 pages.

VOLUME 5 (1938). Containing the autobiography of Ernst H. Krelage; the history of amaryllid culture in Holland by Ernst H. Krelage, Dr. Uphof's important article in which the name *Hippeastrum* is rejected; a revision of the tribes of the Amaryllidaceae; and the species of Amaryllis; outstanding articles on forcing amaryllids by Dr. Grainger and Prof. Dr. van Slogteren; and many other articles on description, cytology, genetics and breeding; physiology of reproduction and amaryllid culture; with 33 plates and 2 figures; a total of 218 pages.

VOLUME 6 (1939). Dedicated to the Union of South Africa, and containing articles on South African amaryllids, including the history of botanical exploration for amaryllids in South Africa, the distribution of South African amaryllids in relation to rainfall, and a review of the Genus *Agapanthus* by Frances M. Leighton; a review of the Genus *Cyrtanthus*, with many excellent line drawings, by Dr. R. A. Dyer; other articles—*Zephyranthes* of the West Indies by Dr. Hume; the Tribe *Gilliesiae* by Dr. Hutchinson; rating of daylilies for garden value by Mr. Kelso; daffodil articles by Jan de Graaff, and many other items on description, cytology, breeding, propagation, and amaryllid culture; with 44 plates and 10 figures; a total of 258 pages.

VOLUME 7 (1940). Dedicated to Latin America, and featuring articles on Latin American amaryllids; biographies of Drs. Philippi and Holmberg; report by Dr. Goodspeed on the amaryllids collected by the Univ. of Calif., Second Andean Expedition; reports on the flowering of the "Blue Amaryllis," *A. procera*; and many other important articles

on the description, propagation, breeding, culture, harvesting and storage of amaryllids. Of special interest are the important articles on the description, breeding and culture of daylilies by noted authorities. With 45 illustrations—30 plates and 15 figures—and a total of 242 pages.

VOLUME 8 (1941). Daylily Edition. The first extensive symposium on the daylily, containing biographies of George Yeld, Amos Perry, Hans Sass, and Paul Cook, and important articles on daylily evaluation, breeding, propagation and culture. Also important articles on Narcissus and other amaryllids. Thirty-eight illustrations—27 plates and 11 figures—and a total of 185 pages.

The prices of the above described volumes are based on the available supply :

Volume 1, 1934, very scarce, \$3.75 each, postpaid.
 Volume 2, 1935, very scarce, \$3.75 each, postpaid.
 Volume 3, 1936, \$3.75 each, postpaid.
 Volume 4, 1937, (double number), \$4.25 each, postpaid.
 Volume 5, 1938, \$3.25 each, postpaid.
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HERBERTIA

VOLUME 9

ALSTROEMERID EDITION

EDITED BY

HAMILTON P. TRAUB

SALINAS, CALIFORNIA

ORLANDO, FLORIDA

THE AMERICAN AMARYLLIS SOCIETY

1942

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AMERICAN AMARYLLIS SOCIETY

Printed in the United States of America

Published May, 1943

This volume contains a total of thirty-five illustrations, seventeen plates and eighteen [text] figures.

PREFACE

Since the publication of 1941 HERBERTIA, many of the Society members have either entered the armed forces of the United States or are otherwise contributing to the war effort. However, in common with our British allies, Americans get a lift from their gardens and this makes it worth while to continue HERBERTIA as a valuable means of relaxation during these trying times.

When Harry L. Stinson took the Alstroemerids under his wing in 1933 at the time the American Amaryllis Society was organized, this plant group was little known and appreciated. For a decade he has now devoted himself to these plants and he is the outstanding authority on them. The results of his work are briefly summarized in this issue of HERBERTIA, the Alstroemerid Edition, that is dedicated to him. We congratulate him on his achievements and wish him much success in his future work.

At the ancient and renowned University of Coimbra, in Portugal, Prof. Dr. Abilio Fernandes has carried on cytotaxonomic researches on the Amaryllids, particularly *Narcissus*, for over a decade, and these outstanding contributions have been published in scientific journals. In recognition of his valuable researches, the Society has awarded him the William Herbert Medal for 1942, an honor that he richly deserves. The portrait of this talented Portuguese scientist; his charming autobiography and valuable summary of his cytotaxonomic researches on *Narcissus* appear in this issue.

In addition to the articles on the Alstroemerids already mentioned, many other valuable contributions on the amaryllids are included in this number of HERBERTIA. Space does not permit mention of all but attention is directed to some of the most outstanding.

We will all thank Major Pam for the valuable check-list of Amaryllid colored plates. It should prove very useful indeed to students of this group since it can be used in ordering bibliofilm prints of the plates and accompanying descriptions. Major Pam is a genuine Amaryllid enthusiast since he did all the research and also typed and corrected the manuscript himself at his home, Wormley Bury. He has published a history of this estate, covering a period of over a hundred years, and we plan to include a review of this article in the next issue.

We are indebted to Dr. Uphof for the review of the species of *Crinum*. He makes available to us the descriptions of *Crinum* species proposed since the appearance of Baker's Amaryllideae in 1888. Dr. Uphof has finished a similar review of *Agapanthus*, and will prepare other reviews for HERBERTIA. The members will be interested to hear that Dr. Uphof was recently called to Washington to assist in the war effort.

Dr. Fernandes, Dr. Anderson, Messrs. Jan de Graaff, and Hornback and Mary P. Finlayson contribute excellent articles on *Narcissus*; Mr. Splinter, J. G. DuPuis, M. D., and Messrs. Bennetts, Hannibal, Hayward and Lytel give us a fine symposium on hybrid *Amaryllis*, which we hope

is the first of a long series; *Hemerocallis* receive well deserved attention—Dr. Shull writes on the diversity of form in daylilies, Dr. Stout on the breeding of red-flowered clones, and also proposes a new *Hemerocallis* species; Dr. MacDaniels, the Chairman of the Daylily Jury, gives an excellent preliminary report, indicating that the work of daylily evaluation is definitely under way; other valuable daylily papers are presented by Dr. Stoutemyer, Messrs. Claar and Chittenden, Prof. Watkins and Fleeta Brownell Woodroffe.

Mrs. Henry writes on *Cyrtanthus* breeding; Mr. Hamor reports on *Zephyranthes bifolia*, Dr. Addicott on *Milla* pollen and Mr. Hannibal writes on several interesting subjects.

Dr. Killip of the National Herbarium is preparing a comprehensive check-list of *Alstroemeria* and *Bomarea* species that we had hoped to include in the present issue, but it was not received in time. It will be published in the 1943 edition.

On account of a typographical error the words "the late" appeared before the name of Arthur Herrington in the dedication of 1941 HERBERTIA. This error has been corrected under "Errata" in the present issue. Also in this issue, T. A. Weston, Associate Editor of *Florists' Exchange*, presents a brief biographical note on Arthur Herrington that gives us more details about the first daylily breeder in the United States.

We owe a debt of gratitude to your Secretary, Wyndham Hayward, whose untiring efforts in behalf of the Society, in spite of his local duties in connection with war work, made this issue of HERBERTIA complete.

The 1943 edition will be the 10th. Anniversary Number and will include reviews of progress in the advancement of the amaryllids since the Society was founded in 1933.

October 15, 1942
115 Carmel Avenue,
Salinas, California

—Hamilton P. Traub

TABLE OF CONTENTS

Alstroemerid Edition Cover Design, featuring Alstroemeria Ligtu, J. Marion Shull.

	PAGE
Preface	3
Errata—1941 HERBERTIA	9
Note to HERBERTIA contributors	9
Dedication	10
Dr. Abilio Fernandes, an autobiography	11
Arthur Herrington, T. A. Weston	13
Alstroemerid Musings, Harry L. Stinson	15
Amaryllid Notes, T. A. Weston	17
Amaryllid Musings, W. M. James	19
Lawrence’s “A Southern Garden,” Hamilton P. Traub	22
Alstroemerid Edition (1942) Cover Design	23

1. REGIONAL ACTIVITY AND EXHIBITIONS

1942 National Amaryllis Show, Orlando, Fla., Wyndham Hayward	24
Amaryllis Meeting of California Horticultural Society, L. S. Hannibal	26
Visits to gardens of daylily enthusiasts, 1942, Elmer A. Claar	28
Alstroemerid Kodachromes	36

2. COLOR DESCRIPTION

Drying flowers in three dimensions, Frances R. Williams	37
---	----

3. DESCRIPTION, CLASSIFICATION AND PHYLOGENY

Alstroemerids cultivated in the United States, Harry L. Stinson	41
The Ixiolirion Tribe, Hamilton P. Traub	53
Notes on Zephyranthes bifolia from its native country, George H. Hamor	60
A review of the species of Crinum, J. C. Th. Uphof	63
Check-List of Amaryllid coloured plates, Major Albert Pam	85
Calostemma purpurea, Mildred Orpet	99
Abstract: article on Callicore-Brunsvigia hybrids, L. S. Hannibal	100
Callicore and Brunsvigia, L. S. Hannibal	101
Amaryllids of Ceylon, T. H. Parsons	106
Hemerocallis altissima, Stout sp. nov.	103
Introduction of Hemerocallis species to British gardens, Fred J. Chittenden	107
Daylily adaptation, Hamilton P. Traub	110
The problem of evaluating Hemerocallis clones, Dr. L. H. McDaniels	112
University of Florida Daylily Trial Garden	115
Evaluation of daylilies for northern Florida, Prof. John V. Watkins	116
Amaryllid genera and species (translations from foreign languages)	116
Foreign Amaryllids Wanted	118
Registration of new amaryllid clones	118
Hybrid Daylily (Hemerocallis) clones	118
Hybrid Amaryllis clones	123

4. CYTOLOGY, GENETICS AND BREEDING

	PAGE
Alstroemerid Breeding Possibilities, Harry L. Stinson	125
Summary of work on cytology of Narcissus L., Prof. Dr. Abilio Fernandes	126
Pollen germination and tube growth in Milla as affected by pure growth substances, Dr. Frederick T. Addicott	133
Cyrtanthus in the little greenhouse, Mary G. Henry	137
Recent trends in daffodil breeding, Jan de Graaff	140
Notes on resistance of daffodils to virus disease, Earl Hornback	147
Mosaic virus in the amaryllids, L. S. Hannibal	149
Burbank's work with amaryllids, Dr. W. L. Howard	150
Diversity of form in daylilies, J. Marion Shull	156
Origin and genetics of some classes of red-flowered daylilies, Dr. A. B. Stout	161
Daylily Breeding Roundup	174
Excursions in daylily achievements, Robert Schreiner	174
Why I breed daylilies, Chas. E. F. Gernsdorff	177
The Russell daylilies, H. M. Russell	178
Daylilies in Arkansas, J. W. House	179
The Nies daylilies, H. P. T.	180

5. PHYSIOLOGY OF REPRODUCTION

Propagation of Alstroemerids, Harry L. Stinson	181
Alstroemeria and Bomarea from seeds, L. S. Hannibal	183
Some observations on crown cuttings of Hemerocallis, V. T. Stoutemyer	187

6. CULTURE

Culture of the Alstroemerids, Harry L. Stinson	193
Naturalizing Narcissi in Missouri, Dr. Edgar Anderson	195
The daffodil in Florida, Mary P. Finlayson	199
Crinodonna Howardii, E. O. Orpet	200
Hybrid Amaryllis Symposium	202
Buller's Hybrid Amaryllis, Wyndham Hayward	202
A future for amaryllis, A. C. Splinter	202
Hybrid amaryllis culture near Miami, Florida, J. G. DuPuis, M.D.	208
Amaryllids in southern California, F. L. Bennetts	210
The Blue Amaryllis in California, A. B. Lytel	213
Sprekelia in southern California, Dr. Thomas W. Whitaker	214
The dependable Alliums, Bernard Harkness	214
Zephyranthes insularum, Margaret Walmsley	218
South African Amaryllids, Perry Coppens	220
Evergreen Hemerocallis in Central Iowa, Fleeta Brownell Woodroffe	220
Daylily winter foliage character in northern Florida, Prof. John V. Watkins	222

7. HARVESTING, STORAGE AND FORCING

Harvesting, storage and forcing of Alstroemerids, Harry L. Stinson	223
--	-----

8. SOCIETY'S PROGRESS

	PAGE
The Secretary's Mail Bag	226
Secretary's Message	229
Report of Trial Collections Committee	230
Notice of 1943 Nominations	231
Officers and Committees	232
Publications of the Society	234
Data card for Hemerocallis	236

THE BUYERS' GUIDE

Make a garden for relaxation, J. N. Giridlian	237
Advertisements	238

LIST OF ILLUSTRATIONS

PLATES

Plate 225 Frontispiece Portrait—Herbert Medalist, Prof. Dr. Abilio Fernandes,	facing page 11
Plate 226 Alstroemeria Ligtu, type, and present day forms	14
Plate 227 Pink forms of Alstroemeria Ligtu	40
Plate 228 Bomarea campaniflora	124
Plate 229 Henry Hybrid Cyrtanthus	136
Plate 230 Daylily Flower forms (Shull)	157
Plate 231 Daylily flower forms (Shull, continued)	159
Plate 232 Pedigree of Theron Daylily	162
Plate 233 Principal color-patterns in flowers of Hemerocallis	164
Plate 234 Wild forms of fulvous daylilies	169
Plate 235 Alstroemerias naturalized at Univ. of Calif. Bot. Gardens	184
Plate 236 Alstroemeria chilensis field and cut Alstroemerias for World's Fair	192
Plate 237 Buller Hybrid Amaryllis (Nos. 1 and 2)	203
Plate 238 Buller Hybrid Amaryllis (Nos. 3 and 4)	204
Plate 239 Blue Amaryllis (A. procera) in California	212
Plate 240 Allium stellatum	216
Plate 241 South African Amaryllids	219

TEXT FIGURES

Figure 70 Alstroemeria Hookeriana	20
Figure 71 Chromosomes of Ixiolirion tataricum	55
Figure 72 Zephyranthes bifolia	61
Figure 73 Calostemma purpurea	99
Figure 74 Flowers of Hemerocallis altissima, Stout, sp. nov.	102
Figure 75 Roots of Hemerocallis altissima, Stout, sp. nov.	103
Figure 76 Typical plant of Hemerocallis altissima, Stout, sp. nov.	105
Figure 77 Cyrtanthus sanguineus	139
Figure 78 Burbank's Sprekelia—Martinique	153

	PAGE
Figure 79 Daylily flower form (Shull)	160
Figure 80 Rhizomes and roots of <i>Alstroemeria aurantiaca</i> and <i>A. chilensis</i>	182
Figure 81 Rhizomes and roots of <i>Alstroemeria pulchra</i>	183
Figure 82 <i>Alstroemeria aurantiaca</i>	186
Figure 83 Daylily clone Meehani, effect of additional day length on growth	188
Figure 84 Mrs. Stinson and daughter with <i>Alstroemeria</i> corsages	194
Figure 85 <i>Crinodonna Howardii</i>	201
Figure 86 <i>Sprekelia formosissima</i> as a cut flower	215
Figure 87 Digging <i>Alstroemeria chilensis</i> plants	223

ERRATA

HERBERTIA, VOL. 8, 1941

Page 4; 6th. line from top, delete the words "the late" before the name of "Arthur Herrington."

Page 42; in legend for Plate 204, for "showin" read "showing."

Page 48; foot-note, 2nd. line from bottom, for "April" read "May."

Page 156; for "*Nothoscordum fragrans*," where it appears, read "*Nothoscordum inodorum*."

Page 178; 8th. line from bottom, delete the phrase "elsewhere in this issue" and substitute "in Vol. 7, HERBERTIA, 1940."

NOTE FOR HERBERTIA CONTRIBUTORS

Correspondence regarding articles and illustrations for HERBERTIA, the Year Book of the American Amaryllis Society, is cordially invited.

STYLE. Manuscripts must be *typewritten* and *double-spaced*. Check with special care all calculations, figures, tables, names, quotations and literature citations.

MANUSCRIPTS AND PHOTOGRAPHS. To insure against loss in the mails, authors should *retain copies* of manuscripts, and the *original negative or extra prints* of photographs, sent for publication in HERBERTIA. Photographs should have the *name and address* of the owner to whom credit should be given, and the *name and size of the subject*, written on the back.

When taking photographs of amaryllids, an effort should be made to include the whole plant—*stem*, if any, *leaves*, *scape* and *flowers*. Separate views of the *bulb* and *roots* are also valuable in some cases. These remarks do not apply to cut-flowers.

*This Volume of Herbertia
is dedicated
to Harry L. Stinson,
patriot, friend, teacher, gardener,
scientist.
His faithful devotion to the
Alstroemerids,
for a decade,
has rescued them from obscurity
—today we count them
among our choicest garden treasures.*



Herbert Medalist — Prof. Dr. Abilio Fernandes

DR. ABILIO FERNANDES

Professor of the Faculty of Sciences of
the University of Coimbra, Portugal

An Autobiography *

I was born in Macainhas, a village in the suburbs of Guarda, on October 19, 1906. My childhood was spent in the country, and during this period I received my primary education.

Following the counsel of my teachers, in this case my parents, although they had very limited resources, they decided that it was necessary for me to have advanced instruction. Thus, after 10 years, I was entered in the Lycee de Guarda, where I completed my secondary education in 1923.

This same year, I entered the Faculty of Sciences of the University of Coimbra with the purpose of obtaining my degree in natural sciences. After preparatory studies in Mathematics, Physics and Chemistry, I became vitally interested in Zoology, Anthropology, Geology and Mineralogy. However, I reserved the last year of my course for the study of Botany. At this time my parents were undergoing a grave financial crisis, and for this reason, I was anxious to finish my degree with purpose of obtaining as soon as possible a position as a teacher in secondary instruction. In this dilemma I gave no thought to my devotion to the study of botany. These things, however, passed in a wholly unexpected manner. There were, in the degree of Natural Sciences, two courses in Botany—special Botany and Botanical Geography, and Morphology and Physiology of plants. These courses were taught respectively by the eminent Professors, Dr. Luiz Carrisso and Dr. A. Quintanilha. The lectures of these two great scholars, didactically impeccable and of remarkable clarity charmed me from the first, since they presented their material in such attractive and stimulating fashion, as to make one thirsty for further knowledge. To these Professors, the students were not only friends to be encouraged by sympathy and understanding, but also companions in the work to which they tried to transmit the devotion to the science to which they had dedicated themselves, and this was the goal of their teaching. Then, life in common, in the laboratory, in the herbarium, in the garden, on trips, attracted me still more toward these Professors, and gave me the desire to become somewhat like they were. And thus, in the warmth of enthusiasm for my Professors, I commenced to interest myself in Botany, a science which each day, gripped me more and more.

Under the direction of the late Professor Carrisso, I studied the taxonomy of vascular plants, ecology and botanical geography; and at the same time my attention was attracted to the complex questions of evolution and natural classification.

* The original was written in the French language. The Society is indebted to the eminent scientist, Dr. Thomas W. Whitaker, La Jolla, California, for the very excellent English translation. The original manuscript in the French Language has been deposited in the United States Department of Agriculture Library, Washington, D. C., where students may consult it. —Ed.

With Professor Quintanilha, I first studied cytology and then organography, the physiology and systematics of cellular plants.

All of these studies were pursued during the year 1926-1927, and it was therefore a year of intense effort. Fortunately, the work was crowned with true success, as I had the good fortune to pass my examinations with high rank, and was invited to occupy the position of Assistant in the Botanical Institute of Coimbra.

I was in charge of the practical work of the course in Botany (Medical Botany, General Botany, Morphology and Physiology and Biology). At the same time under the direction of Professor Quintanilha, I specialized in the domain of Cytology.

Once this specialization was acquired, from that time on I have been preoccupied with research. About this time (1929) the work of several cytologists (Navachine, Heilborn, Delaunay, Tischler, Babcock, etc.), suggested that a great many problems in systematics could be solved by a comparative cytological study of forms belonging to the same taxonomic group. In addition, this work has demonstrated that the study of variability of the chromosomes among individuals of the same species and a comparative study of the idiograms of neighboring species can contribute much to solving the problems of evolution and in turn to the establishment of a system of natural classification. Having had an interest from the beginning of my studies in the questions which this work initiated, the results of this research influenced me profoundly and has led me toward cytology.

After some experiments with plants belonging to the Liliaceae and Amarylidaceae, I chose the genera *Aloe* and *Narcissus*, which seemed to be very favorable material from the point of view of the studies I had in mind. The first results of my research were the subject of some notes presented to the Society of Biologie (Section de Coimbra), and a frequently quoted article "Estudos nos cromosomas das Lilacées e Amarylidacées", published in the "Boletim da Sociedade Broteriana." This work constituted my doctor's thesis, for which I was examined in the month of December 1931.

After having obtained the rank of Doctor of Science in Biology, I pursued my research in the genus *Narcissus*. This permitted me to elaborate another thesis, "Novos estudos cariológicos do género *Narcissus* L.", which I presented in competition for the post of Adjunct Professor of Botany. Having been elected unanimously, I was assigned to this post in January, 1934.

In addition to the practical teaching, I have also been charged with theoretical instruction, particularly in Medical Botany and the course in General Botany.

In 1935, my chief, Professor Quintanilha, was obliged to leave the Botanical Institute. This withdrawal was a very grave loss in the life of the Institute, since the teaching and research work have suffered a great deal through the absence of this incomparable Professor. As a consequence of the diminution in the number of the professors, the Council of the Faculty of Sciences decided to place me in charge of

instruction in the course which belonged to Professor Quintanilha, and for this reason, the time which I have been able to give to research work has been almost negligible.

In 1936, after having fulfilled the functions of Adjunct Professor during three years, I was named definitely to this position.

In 1937, M. le Professor Carrisso, Director of the Botanical Institute, was on his third trip of exploration in Angola. Unfortunately, during this trip, he died suddenly in the Desert de Mossamedes in the month of June. This was a very great loss, since, with the passing of Dr. Carrisso, the Institute of Botany lost a Professor who was much loved by his students, a man of exceptional activity, and organizer of unlimited capacity and a remarkable Director who restored the Institute to its ancient grandeur.

After the death of M. le Professor Carrisso, the Department of Botany was without any professor in the chair of Botany. For this reason, the Council of the Faculty of Sciences, in the month of September 1937, engaged me to fulfill the functions of this position, a place that I have occupied, by contract, until the 28th of February, 1942. In the month of May of this last year, after serving as Chairman of the Department of Botany, I was definitely named Professor of Botany on June 25, 1942.

In spite of the limited amount of time, which since 1934, the scholastic work has left me, I have continued my research in the cytology of the genus *Narcissus*, research which the "American Amaryllis Society" has recognized as distinguished, in granting to me the honor of the William Herbert Medal.

[A "Summary of Work on Cytology of the Genus *Narcissus* L." by Prof. Dr. Fernandes is included in Section 4, Cytology, Genetics and Breeding.—Ed.]

ARTHUR HERRINGTON

T. A. WESTON, *New York*

Arthur Herrington, as I have pointed out in the *Florists Exchange*, page 63, April 11, 1942, issue, has been manager of the New York Flower Show for 27 years. He has been president of the New York Florists' Club; last year he was honored with the Massachusetts Horticultural Society's Gold Medal; he wrote a book on Chrysanthemums in 1905; he has lectured on landscape gardening for many years and was prime mover of the Chas. H. Totty memorial fund.

He crossed *Hemerocallis aurantiaca major* with *H. flava* soon after he came from England to lay out the McK. Twousbly estate at Convent, N. J., and he named the resulting hybrid *Florham*, which is the name of the aforesaid estate. He gave stock of it to Dreers who distributed it. Obviously it was the first hybrid daylily raised in the United States, and excepting Yeld, Arthur Herrington was ahead of the field though he



Harry L. Stinson, Seattle, Washington

Feuillet's Alstroemeria Ligtu, upper left; forms of *A. Ligtu* in Stinson collection—a form near to *Feuillet's* type, upper right; form in the trade as *A. Ligtu*, but may be *A. haemantha*, note leaves, lower left; the beautiful pink form of *A. Ligtu*, lower right.

made no attempt to go further. His only reason for making the cross was that *Hemerocallis aurantiaca major* wasn't hardy and he figured a cross on *H. flava* would give the needed hardiness which it did since *Florham* to this day is still catalogued.

[The reader should also consult "The genesis of modern daylilies" by A. Herrington, bull. gard. club Amer. 7(24) :44-45.1942. —*Ed.*]

ALSTROEMERID MUSINGS

HARRY L. STINSON, *Washington*

Reference to botanical publications of Herbert's time and shortly thereafter discloses the fact that Herbert, Lindley, and other prominent botanists entered into many lively discussions as to the exact identity of *Alstroemeria Ligtu* which Father Feuillet had found, described, and illustrated in his Journal (See plate 226.) Linnaeus was so noticeably reticent in any general discussion of it, that I have often wondered just, why?—when he was so verbose in his description and praise of *A. pelegrina*. The answer was discovered when I translated Jacquin's description of *A. caryophyllaea*. He writes at the end of his description that, "Linnaeus, senior, took for granted the three species of Alstroemerias in his Systema and Species Plantarum from Feuillet, but he abstained from any description on a plant which he had not seen. While I, on the other hand, do remember having seen this plant flourishing in flower under the title of *A. Ligtu* thirty years ago in the gardens of Caesar Schoenbrunn, which plant afterwards perished. I neither described nor illustrated it, but in so far as I recall, it is similar to Feuillet's figure. Certainly it is not the plant which I have just described, *A. caryophyllaea*, on account of its carnation-like odor, which now is considered as *A. Ligtu* in all botanical works." This, evidently, explains why Linnaeus did not give more attention to it, and evidently Alstroemer did not find it growing in or near Cadiz, Spain, where he found *A. pelegrina*. Although Linnaeus, Jr. does say in his supplement that, "he had received this (*A. pulchella*) as well as the drawings of the other species from his friend Alstroemer," who was still in Spain.

Herbert comments that, "By a strange mistake, when *Bomarea edulis* and *A. caryophyllaea*, both tender tropical plants, were brought from the East Coast and West Indies, they were confounded with *B. salsilla* and *A. Ligtu*, and have usurped their names in our stoves and in modern botanical works."

Professor John Lindley in 1839 gives in *Botanical Register* a description and illustration of what he considers to be *A. Ligtu*. Comparing his illustration with that of Feuillet's, I find myself at a loss to detect any point of similarity between the two. If it is *A. Ligtu*—I am reluctant to question Prof. Lindley's decision, arrived at, no doubt, after much study in the excellent herbaria at his disposal—could it then be, that Feuillet might possibly have described and illustrated the wrong plant? From his notes I am somewhat inclined to harbor a hunch that

he mistook a form of *A. haemantha* for *A. Ligtu*. Or does it exist, notwithstanding Prof. Lindley's reference, which might easily refer to a form of *A. pulchra*? Especially so, now that it is generally conceded that the *A. Ligta* of Ruiz and Pavon and the *A. Ligtu* of Linnaeus, Jr. is in reality *A. caryophyllaea*. This past season I did find a flower with a white center on the two upper petals instead of the usual golden yellow, and such a form might have been the basis of the white of which Feuillet says, "Two of which are streaked by some white bands which form acute angles with the rib of the same color which traverses their length." In so far as the ciliation on the leaves is concerned, it is highly probable that he completely overlooked this since it is rather inconspicuous on some forms and especially so when the blooming stems are defoliating at the base, and he might have also overlooked the spiral twisting of the leaves mistaking this feature for the natural dying away of the leaves. I am still more inclined to this conclusion for the reason that both the Index Kewensis and Baker, with access to the unlimited facilities of the Royal Botanic Gardens and other well known herbaria of Chilean plants in and about London, constantly refer to other species as being closely allied to *A. Ligtu*. Such plants have little or nothing in common with that of Feuillet. Are they confounding the *A. Ligtu* of modern botanical books which is really *A. caryophyllaea* with Feuillet's? I believe they are.

Could it be that Feuillet's plant has become extinct or that it has become so hybridized with *A. haemantha* and others that it is no longer recognizable, for it is in Ruiz and Pavon's Flowers of Chile and Peru, 1802, that we find the next reference to *A. Ligta*, and many things could have happened between 1712 and 1802.

In an observation appended to the latter's description of their *A. Ligta* they comment that, "Figures and dried specimens of this and the following species indigenous to the Royalty of Chile, we have lost in a well remembered shipwreck; therefore we do not give sketches of them here." This loss has been most unfortunate. In my reading I came across a biographical sketch of these gentlemen in a Spanish edition of Geografia Botanica de Chile by the German Botanist, Dr. Karl Reiche, in which he writes that they personally were in this shipwreck and it is well that they might write, "*naufragio memorato*." These last two words puzzled me for I had come across no references to any such shipwrecks.

Edward Poeppig, who also travelled in and described several alstroemerias from this region had a similar experience but his misfortune happened in one of the torrential rivers. He lost all of his instruments as well as his specimens and had to return to Europe to replace the former before continuing his work.

Linnaeus did a little philosophizing in his "Planta Alstroemeria" which might be of some interest in so far as it bears upon our subject. The botanists of that time were mostly medical men and based their medical science chiefly upon the "virtues" of the plants listed in their Herbals. Our learned doctor is not thoroughly convinced that, "all plants are destined for economic and medical use, although moderate

use is made of so many in the wonderful economy of Nature.” He goes on to add that, “the most fragrant plants do not always produce the most beautiful flowers, while many plants are unfit for use because of their tenacity and strong odor.” While he did not support the extremist’s idea of plant economy, he nevertheless was a little hesitant to break completely away from the traditions of the herbalists and possibly earn their ill-will; for he hastens to add, “I seem to detect a something in the root, which in a measure comes close to *Asparagus*, *Smilax*, or *Sarsaparilla*; possessing diuretic virtues, which authors are want to call aperient, diluting and drying. . . . Furthermore Feuillet contends by the testimony of the Chileans that a cold infusion of this *Salsilla*, administered in the place of the usual beverage brings almost instant relief in distress of the stomach.”

The quest for new species from South America has brought some very interesting contacts. One in Southern Chile was forced to give up his business due to war conditions, and the last word from him was to the effect that he contemplated going to Patagonia and engage in a silver fox farming venture and wished literature on our most approved methods which I was able to find and forward on to him. I wish him well. Another correspondent replied that he had four species of *Alstroemeria* for which I sent the necessary money, but nothing ever came of it, except to learn through another source that he was not to be trusted and was no longer in the country. However this is not generally the case, for almost without exception all correspondents have been most generous in their efforts to obtain the desired seeds.

Since this is supposed to be a species of musings, it may not be amiss to muse or dream that the wheel of fortune may go round and round and when it stops, it will send me to that far away region where the *alstroemerias* and *bomareas* grow so that I may retrace the steps of Father Feuillet and find that elusive *Ligtu*.

AMARYLLID NOTES

T. A. WESTON, *New York*

Apropos W. M. James’ remarks on *Nothoscordum inodorum* (syn. *N. fragrans*), I have had this for some years in my New Jersey garden, 25 miles north of New York City with winter temperatures well below zero. In rock work with a covering of salt hay, the old bulbs survive and even retain their foliage while seedlings come up, even in the path, and flower the same season. The flowers certainly are not showy but they are produced over a long season.

Amaryllis advena—E. G. Orpet of Santa Barbara, Calif., years ago sent me bulbs which as potted plants bloomed in the fall but the large bulbs failed to survive in the cellar. The soil from the pot was apparently thrown on the rose bed and must have harbored a tiny bulb for some two or three years later I was astonished to find a plant flowering in this bed close to the retaining stone wall. The bulb was practically on the surface. Without special protection it survived that winter, but later the cluster was moved to a more sheltered situation where flowers

were again produced that season, but eventually the stock disappeared although nearby *Callicore rosea* has hung on up to this time. This latter species has flowered but once and under salt hay went through the winter of 1936-37 when we had 24 degrees Fahrenheit below zero. Most years the clusters of bulbs have made masses of leaves in the late fall. Under salt hay these are largely retained but the past fall no leaves were made, nor flowers. However, in March of this year, new leaves have proved that the bulbs are still alive and I am wondering if they have changed their habit in line with that of *Lycoris squamigera*, which starts leaf in March, goes to rest, blooms in the fall and then rests over winter.

Lycoris radiata, by the way, refused to bloom in pots so it was planted against a west wall, very dry, where for the past three years the bulbs have held their leaves all winter unprotected and of course the bulbs have multiplied. But this is about all that this species ever does, for I know of no one who has bloomed it indoors or outdoors in this vicinity. In this respect, it is like the presumed hybrid *Vallota* which years ago came with *Nerine* bulbs from the Isle of Guernsey. The bulbs flowered once and then died except a few small bulbs that have since made little or no progress.

It may be worth recording that in the fall of 1941 I left my nerines, *Fothergilli*, *coruscans major*, *crispa rosea*, *Bowdeni* and one or two hybrids as well as a variety of hybrid lachenalias, in a frame too late and they were badly frozen. The hybrid and *Fothergilli* nerines as well as most of the *Bowdeni* were so damaged that the bulbs parted from the roots, the bases being killed. *Nerine crispa rosea* was not harmed beyond the foliage, and some bulbs flowered the past fall as usual. One or two *Bowdeni* bulbs apparently were not so badly frozen as they remained sound but have to date (April 1942) made little or no leaf growth after more than a year. Some of the bulbs that lost their roots, were cross-cut and left on the bench for a time and these made bulblets that have grown. One bulb of *Fothergilli* similarly treated has also yielded a few bulblets but the hybrids and *coruscans major* were too softened by the frost to produce anything. Practically all the *crispa rosea* have gained in size. The lachenalias in a few instances were killed, but most of the large bulbs before decaying produced tiny bulbils, large numbers of these being found in the pots the following summer. These have increased in size the past winter but have not flowered.

To test their hardiness, I placed a pot of newly planted *Leucocoryne ixioides odorata* in a frame last November, but they couldn't take it, obviously needing heavier protection. Bulbs of this subject, one and two years old, that had flowered in the greenhouse at 50-55, last fall, were planted very deeply in 6-inch pots, practically at the bottom, and they flowered in February better than ever before, 2 to 4 stems on each bulb. One pot of seedlings sown in April 1941, startled me by flowering this season. The bulbs were quite small when potted.

The multiplicity of bulb production of *Nerine Bowdeni* as mentioned by Mr. James is found in some daffodils. We used to call them "horse teeth" and *Victoria* was given to the habit. It is my impression

that the habit is inherent in some varieties and the best thing to do with such stocks is to rogue them although it is claimed that deep planting will cure the habit.

I obtained a packet of hybrid *Hemerocallis* seeds from Dr. Leonian several years ago and raised some 30 plants, all but one being red and of better color than any of the named sorts I had seen up to that time, ranging from bright crimson to chocolate maroon. The petals of all are narrow but as a rule the plants are strong and free flowering. I saved seeds of one plant and the seedlings were reds and yellows.

Mr. James' studies of the nerines indicates that these develop their flowering buds in succession as in *Amaryllis*, but what I would like to know is—Why are nerines so shy blooming? The hybrid *Dainty Maid* which came from Guernsey with the others, never did flower although the bulbs were of good size. The other sorts, especially *coruscans major* and *Fothergilli* were intermittent; even *Bowdeni* refused to bloom for some years. *Crispa rosea* was the only certainty, and this like *Bowdeni* retains its foliage at all times. I tried leaving them alone and also shaking them out, but the flowers were never a certainty. If the buds are initiated years ahead, what happens to them?

Amaryllis pratensis is another problem child. What does it dislike when grown in a pot? In England this gorgeous red flower is reasonably certain to flower outdoors in sheltered places, but one plant raised from seeds three years ago refuses to make more than 2 or 3 grassy leaves that hang over 12 inches or more. The bulb is still less than a half inch in diameter.

And what is the matter with large plants of *Amaryllis procera*? I have one that this season has made long leaves, but the hoped for buds are still awaited. The plant is growing nicely in orchid peat and sphagnum. The leaves are up to 2 feet long. However, seedlings do not thrive in this compost for the roots die away within a week or two. Germination in sand last spring (1941) was nearly 100 per cent, but potting into sandy soil didn't help them and osmunda and sphagnum was worse. Now they look far worse in April 1942 than in September 1941, but they are gradually making new roots in nothing more than plain sand with a little soil below.

AMARYLLID MUSINGS

W. M. JAMES, *California*

One year ago I was busy grading and preparing bulbs for shipment. At the present time I am just planting the last of a large shipment of cymbidiums from England. As Rancho Rinconada specializes in these, orchids and camellias, it has been a transition period for me and the time has passed more quickly than I ever imagined it could. The experimental bulbs moved from Las Positas Nursery are doing well, in spite of the fact that so far their care has not been all it might be. Another season should see things quite well organized.

The plant, shown in Fig. 70, appeared as a stray several years ago among some *Alstroemeria* seedlings in Mr. Orpet's garden. All records of its source or the time it was received were lost. Identification of a plant acquired in this way is not easy because often many of the parts are larger and more vigorous than they are when growing under natural conditions. After observing the plant pictured for several seasons and



Fig. 70. *Alstroemeria Hookeriana*.

Photo by W. M. James

getting others to do so also, there appears the possibility that it may be referred to as *Alstroemeria Hookeriana*. The description found in Kunth's Enumeratio (footnote—translated from the Latin by Mr. Harry L. Stinson) was used and is quoted for reference. Compare also Plate 171, HERBERTIA 7:27, 1940. The plant figured there apparently does not fit the description that follows.

A. hookeriana, Schults Systema, 7.738; Herbert Amaryll. 95.t.1. f.1.2.4.5.17.; Roemer Am. 249.

Stem 5-12 inches high; leaves glaucous, sessile, twisted slightly, not resupinated, 3 inches long or under, 5/32nds wide; peduncles erect, bracteate, forked at the base, 2-4 flowered; secondary peduncles erect, close together; perianth almost 1½ inches, pale rose with a green tip; sepals obovate, apiculated, petals similar, acuminate; lower portion on the upper petals whitish and line-speckled, above with a pale yellow spot; capsule globose, purplish ribs. (Herbert.)

A. rosea Hooker Exot. Flor. t. 181; *A. Hookeri*, Lodd, Bot. Cab. t. 1272.

Chile. Stem simple, erect, slender, glaucous, as well as the entire plant smooth; leaves linear, glaucous, slightly twisted, scattered, few; inflorescence two branched; with mostly six flowers, erect; peduncles long, slender, with a foliaceous bract at the base; segments of the perianth rolled into a tube at their base, open at the apex, almost equal; sepals wider, tapered toward the base, upper part slightly serrated, faintly lined within, striated on the outside with deep purple; petals linear-spatulate, the lower exterior one crazily marked and striated, two lateral ones with golden yellow lines above the middle, dotted with red; all with long slender points and green tips; filaments purple; three anthers discharging pollen at the same time, purple, when exhausted becoming a swarthy green; ovary turbinated, deeply grooved; style column purple, shorter than the stamens, eventually becoming longer; stigmas three, recurved. It comes close to *A. pelegrina*. (From Hooker. Re-worded.)

Note—Kunth also describes a specimen which he says he saw growing in the Berlin Garden.

A short time ago I saw flowers of *Alstroemeria violacea* at Mr. Orpet's. It is beautiful and I look forward to having a few plants some day.

Since my introduction to bomareas a few years ago, I have wondered many times just how they could be used. Most of the species I have seen have a weak, vine-like stem which twines around some stiffer object for support. Apparently they flower best when the roots are in the shade and the blossoms have a chance to open in more or less full sun. Small plants of *Bomarea caldasiana* planted under *Feijoa Sellowiana* a few years ago bloomed this season and the reddish flowers showed up nicely on the gray-green foliage of the shrub. This gives promise that the bomareas will be effective when planted under shrubs where the flowering stems can climb up through branches and bloom in brighter light on the outside of the shrub. Even if the *Bomarea* stems and foliage die in the winter, which they generally do unless grown quite warm, they will be on the inside of the supporting shrub and not detract from its appearance.

Climatic and soil conditions in Ojai are much different than are those in Santa Barbara and I look forward to watching the bulbs "perform" in their new home. *Callicore rosea* (syn. *Amaryllis belladonna*, Herbert, not Linn.) is already in bloom—earlier than in Santa Barbara.

Ojai, Calif. July 25, 1942.

LAWRENCE'S "A SOUTHERN GARDEN"*

HAMILTON P. TRAUB, *California*

Cultural America has reached the age of maturity in most fields and with the advent of such finished masterpieces as Lawrence's "A Southern Garden" we can definitely say that gardening as a fine art is also included. In this connection it is interesting to note that Van Wyck Brooks, in "New England Indian Summer"—that soul-searching analysis of the sins of our fathers which undoubtedly contributed in no small measure to the inevitability of World Wars I and II—makes no apologies for including the work of Olmstead, the late great landscape artist, along with the other fine arts. This is indeed a sign of real maturity.

In such a grown up America, it is natural to expect gardening books of the highest merit and one is not disappointed in the major event for the gardener in 1942—the appearance of Elizabeth Lawrence's book. It is subtitled "A Handbook for the Middle South" but it will prove to be much more than that for it will undoubtedly be used as a model for regional gardening books all over the American Continent.

The book is original and is entirely free of pedantry and is not complicated in make up. Therein lies its chief charm. One realizes at once that one is reading a classic in the sense that the book is ageless. Miss Lawrence apparently realizes that there are an abundance of good garden cyclopedias but that there is a great need for a basic plan for the selection, arrangement and appreciation of plants. This basic plan she gives us, it consists of four subdivisions corresponding to the seasons. The subject matter is charmingly presented from personal experience which includes world wide contacts. The entire work leaves the impression of a prose poem.

No doubt, much of the success achieved by Miss Lawrence is due to her original viewpoint, and probably no writer on gardening has ever stated his objectives so clearly. She is interested first of all in gathering plants from all parts of the world that will thrive in the part of the country in which she lives. We learn that "it is the garden value that interests me rather than the rarity—or even beauty." The reader is reminded that "dirty fingernails are not the only requirement for growing plants. One must be as willing to study as to dig for a knowledge of plants is acquired as much from books as from experience." She challenges the reader with the statement that "I am writing, then, not for those who want to grow rare and difficult plants, but for those who want to grow a variety of plants in an average garden, giving them a reasonable amount of care and spending a reasonable amount of intelligence upon them." Finally Miss Lawrence is an artist first and last—"One thing more, I do not mean to lay undue emphasis on plants. Plants are the materials from which the garden is created. I think of a garden not as a manifestation of spring (like an Easter hat) nor as beds of flowers to be cut and brought into the house, but as a place to be in and enjoy every month of the year." The garden thus becomes an

* A Southern Garden—A Handbook for the Middle South, by Elizabeth Lawrence. University of North Carolina Press. Chapel Hill. 1942. \$3.00.

essential part of the gracious art of living, which is after all the most important mission and activity of man.

Nowhere has the reviewer read such an enchanting description of the winter garden as in Part I of this book. From inspiration thus received, he will plan his with greater care and enthusiasm hereafter.

Part II begins with spring daffodils, hyacinths and other early bulbs, shrubs, tulips, and continues with a long list of enchanting subjects, ending on the note of roses in the South.

The theme of daylilies as a vehicle for introducing southerners to the summer garden is presented in Part III. Other members of the Amaryllis Family are also fittingly considered—*Allium*, *Cooperia*, *Crinum*, *Hymenocallis*, *Lycoris*, *Pancratium*, *Sprekelia* and *Zephyranthes*.

Again, Part IV, the Climax of Fall, is introduced by a section on the Amaryllis Family—*Lycoris*, *Amaryllis*, *Sternbergia*, *Zephyranthes* and *Crinum*. Other sections are devoted to late annuals and perennials, chrysanthemums, etc., and finally fruiting shrubs.

An appendix gives a most valuable selected list of blooming dates based on records kept by Miss Lawrence.

This is a book that should be reviewed in *Time* and *Life* magazines, the institutions that have done so much to bring other forms of art into close harmony with everyday American life. It is also a book that the book clubs should adopt without delay. In fact it is a book that everyone with a plot of ground should read, and that landless persons should peruse again and again so that they will not be content to remain landless any longer.

ALSTROEMERID EDITION (1942) COVER DESIGN

The cover design of this Alstroemerid Edition represents a flower stalk of bostryx of *Alstroemeria Ligtu* drawn by the eminent artist and horticulturist, J. Marion Shull, from cut flower specimens sent by Harry L. Stinson from Seattle, Washington to Chevy Chase, Maryland, a distance of some 3,000 miles, by air express. Although the package was delayed a day or so due to war conditions, the flowers were in fairly good condition so that Mr. Shull could use them as the basis of his design.

Mr. Stinson also included cut flowers specimens of other *Alstroemeria* species, and these together with the *Ligtu* blossoms were enjoyed by the Society members in Washington, D. C. and vicinity.

1. REGIONAL ACTIVITY AND EXHIBITIONS

1942 NATIONAL AMARYLLIS SHOW, ORLANDO, FLORIDA

WYNDHAM HAYWARD, *Florida*

The American Amaryllis Society, after two years of holding its Florida shows in the Mead Botanical Garden, moved back into the Orlando Chamber of Commerce Building for its Ninth Annual National Amaryllis Show, April 14-16, 1942, and with a resulting attendance of many thousands, marked up a new high in success for this event.

The 1942 show was presented as a feature of the Orlando Centennial Pioneer Celebration, which attracted throngs of tourists from all parts of the Southeast and many winter visitors from the North. The exhibition was staged as in former years, in the main downstairs lobby of the Commerce Building, and benches lined the walls with hundreds of gay and gorgeous blooms. Admission was free to the general public on the three days.

Mr. Ralph W. Wheeler of Winter Park, treasurer of the Society since its organization, was again the manager of the National Show, and produced an outstanding and colorful display which attracted a steady procession of flower lovers morning, afternoon and night on the show dates. The Society had the generous and whole-hearted cooperation of the Orlando Men's Garden Club, Dr. L. C. Ingram, acting president, and of the Greater Orlando Chamber of Commerce, in the plans and details of the arrangements.

Mr. A. C. Splinter, eminent South Florida horticulturist and Amaryllis specialist, superintendent of the Arthur Curtiss James Estate at Coconut Grove, Fla., was the chief judge, and found the competition close in most of the classes. Top honors in hybrid Amaryllis displays were won by the Wheeler-Springer entries, (R. W. Wheeler and John R. Springer, jointly) which included numerous fine show specimens of Dutch and other fancy types.

Second place in show honors for Amaryllis went to M. C. Varnier of Fort Pierce. Crinum flowers were entered by a number of growers, including John R. Heist, Wyndham Hayward and Mrs. F. G. Yerkes.

Interesting exhibits of *Zephyranthes*, *Narcissus*, *Clivia* and *Amaryllis* species were set up by Heist, Hayward, Frank Vasku and Mulford B. Foster, noted plant collector and landscape architect of Orlando, Fla., including two rare and unidentified *Amaryllis* species from Brazil. One of these was a greenish, up-turned flower, something like *A. aulica*, and the other was a glorious crimson-flame bloom, apparently a "super" *Amaryllis belladonna*, Linn., and very showy and beautiful. These were found in their native habitat in Brazil by Mr. Foster and brought back to Florida on his plant exploring trips.

On the second night of the show, April 15, Elmer A. Claar, of Chicago, Ill., chairman of the daylily committee of the American Amaryllis Society, gave an illustrated lecture with his colored motion pictures of Iris, Peony, Amaryllis and Hemerocallis gardens north and south. The

films were shown in the third floor auditorium of the Commerce Building before an enthusiastic audience of more than 300 Central Florida flower lovers, who rose to give Mr. Claar an ovation at the end of his remarks.

The complete list of prize winners in the show follows:

Class 1, single entries of *Amaryllis* species, first, Frank Vasku for *Amaryllis Alberti* (double); first, (two ribbons) M. B. Foster, for rare *Amaryllis* species collected in Brazil; first, Wheeler-Springer, for U. S. D. A. collected type *Amaryllis Belladonna* Linn.; first, M. C. Varnier, for *A. rutila* var. *crocata*; first (Florida type *Amaryllis belladonna* Linn., var. *major*,) Wyndham Hayward; second Frank Vasku.

Class 3, best display of hybrids and species, first, Wheeler-Springer; second, M. C. Varnier; third, L. S. Thornton. *Class 4*, white without markings, first, Mead Botanical Gardens; second, Wheeler-Springer; third, E. A. Peterson. *Class 5*, White with slight red markings, first, M. C. Varnier; second, Wheeler-Springer; third, Wyndham Hayward. *Class 6*, White with heavy red markings, first, Wheeler-Springer; second, Mrs. J. H. Churchwell; third, Wyndham Hayward. *Class 7*, Red with White star, first, Wheeler-Springer; second, M. C. Varnier; third, Ralph B. Piper. *Class 8*, Light red (self), first, Wheeler-Springer; second M. C. Varnier; third, L. S. Thornton. *Class 9*, Orange red (self) first, Wheeler-Springer; second M. C. Varnier; third, L. S. Thornton. *Class 10*, Scarlet (self), first, Wheeler-Springer; second, Frank Vasku; third, M. C. Varnier. *Class 11*, Crimson (self), first, Wheeler-Springer; second, M. C. Varnier; third, William Cammack. *Class 12*, Dark Red (self), first, M. C. Varnier; second, Wheeler-Springer; third, Frank Vasku. *Class 13*, Pink, first, Wyndham Hayward; second, M. C. Varnier, third, Frank Vasku. *Class 14*, Any other Color, first, Wheeler-Springer; second, Mrs. J. H. Churchwell; third, M. C. Varnier. *Class 15*, Best Flower in the Show, first, Wheeler-Springer. *Class 16*, Double hybrid *Amaryllis*, first, J. J. McCann.

Class 758, *Brodiaea*, first, Frank Vasku; *Class 623*, *Hemerocallis*, first, Frank Vasku; *Class 622*, *Hemerocallis*, first, Frank Vasku; *Class 602*, *Hemerocallis* collection, first, Wyndham Hayward; *Class 1357*, *Clivia*, first, M. B. Foster; second, Wheeler-Springer; *Class 754*, *Allium*, first Mrs. J. H. Churchwell; *Class 1403*, *Zephyranthes*, John R. Heist, first, for *Z. Treatiae*; Mrs. J. H. Churchwell, 1st for *Z. atamasco*; W. Hayward, 2nd for *Z. atamasco*; *Class 1611*, *Narcissus* (Jonquil) first, Wyndham Hayward.

Class 110, *Crinum* species and hybrids: *Crinum Louis Bosanquet*, first, John R. Heist; *Crinum Cecil Houdyshel*, first Wyndham Hayward; second, John R. Heist; *Crinum Peachblow*, first, Mrs. Fred G. Yerkes; *Crinum Powellii* var. *Krelagei*, first, Wyndham Hayward; *Crinum Wormley Bury*, first, Wyndham Hayward; *Crinum Major Pam*, first Wyndham Hayward; *Crinum Mrs. James Hendry*, first, Wyndham Hayward; *Crinum Powellii album*, first, Wyndham Hayward; *Crinum Rawlinsii*, first, Wyndham Hayward.

Certificates of Horticultural Merit, to L. S. Thornton, for large-flowered red *Amaryllis* with three scapes in full bloom; to Mulford B.

Foster for new *Amaryllis* species collected in Brazil; to Mulford B. Foster for *Clivia*.

First Class Certificates for individual choice blooms of hybrid *Amaryllis*; Wheeler-Springer, 3; M. C. Varnier, 2; Mead Botanical Gardens, 1; Mrs. J. H. Churchwell, 1.

Awards of Merit: Wheeler-Springer for *Amaryllis* exhibit; Mulford B. Foster for exhibit rare *amaryllids*; Wyndham Hayward for exhibit of *Amaryllis*, *Crinum* varieties, and other *amaryllids*.

AMARYLLIS MEETING OF CALIFORNIA HORT. SOCIETY

L. S. HANNIBAL, *California*

Some time back Sidney B. Mitchell, President of the Calif. Hort. Society, proposed a joint conference with the American Amaryllis Society—the meeting being set for the afternoon of Saturday, April 18th, 1942 and conforming to the usual third Saturday of the month on which the “Cal-Horts” have their regular meetings. These are held in the spacious club rooms of the Commonwealth Club of San Francisco. Some 250 Horticultural Society members were present, but in spite of the advance notices sent to all local California A. A. S. members, only a very few found it possible to attend. Realizing at the last moment that the long contemplated round table conference was hardly practical since few participants were present, Mr. Herman Brown of Gilroy and the writer decided to deliver a joint discussion on “Hardy Amaryllids for Central California.” Fortunately Mr. Brown had had favorable weather conditions for his hardy hybrid *Amaryllis* and he brought a number of his choice forms; thus much of the discussion centered about the culture of these beautiful plants.

During the last twenty years Mr. Brown [HERBERTIA: 6, p 203, (1939)] has not only developed one but several strains, some containing the best blood of the U. S. D. A., Dupont, and Dutch hybrids, but his own free flowering fragrant Leopoldi “A” strain which can endure the cold, wet winters of central California without bulb loss is, in the opinion of several, including the writer, one of the finest forms available. The apparent absence of *A. auricum* and *A. belladonna* Linn. blood which normally introduce the corona, green in the throat, or a light orange cast, has made it possible to obtain many blooms with a snow texture which would be the envy of any daffodil breeder. One clear, pure pink which attracted much attention was so far superior to several named forms that it belongs to a class of its own and is well worthy of registration.

The S. F. bay area of California is in the marginal zone for outdoor plantings of hybrid *Amaryllis*. The broken terrain makes use of these plants possible only in warmer pockets. In pointing this out Mr. Brown suggested that in questionable areas winter protection or conservatory culture should be considered. Under his outdoor growing conditions it takes 4 years to get large bulbs, but flower spikes can be expected every 4th. leaf in the mature plant. Soil enrichment with well rotted manure is desirable, but winter resting is not strictly necessary. In the interior valleys light shade is advantageous since the low summer humidities and hot sun can burn the leaves black.

The writer in turn discussed *Callicore*, *Crinum*, *Nerine*, *Zephyranthes* and several other hardy types of bulbs which do well under the varied conditions which prevail on the west coast. A portion of this discussion appeared later in the C. H. S. Journal [Vol. 3, No. 2 (1942)].

Regarding the two forms of *Callicore*, *major* and *minor*, which are so common in California, the writer pointed out that the source of these bulbs was quite obscure and no mention of similar clones could be found in European literature. The "major" is apparently intermediate between the type and *Spectabilis bicolor* Sprenger, whereas "minor" is a small form of *C. rosea* of which there are several clones in circulation. The recent introduction of the *Brunsvigia* X *Callicore*, or *multiflora* hybrids from Australia has opened up a new field of breeding and we should have new material available in the near future. For those who dislike bare scapes the use of the evergreen *Amarcrinum Howardii* was suggested.

Crinums, being essentially semi tropical are not well adapted to our local garden conditions, but of the hardier *C. Moorei*, *C. bulbisperum* (*longifolia* or *capense* in trade), and the *Powellii* hybrids including *C. Cecil Houdyshel* make the best showing here. The writer had a specimen of the latter which was put on display along with a group of *Cyrtanthus angustifolia*. Both plants were of interest to several specialists present.

Zephyranthes candida, *Ajax*, *grandiflora* and *Simpsonii* were suggested for the rock gardens, and the hardiness of *Clivia*, *Pancratium* and some *Hymenocallis*, such as *H. calthinus* and *H. tenuifolia*, were briefly touched upon.

During the question period that followed, identification of several plants was requested including *Haemanthus coccinus* and *Ismene*. The winter rest periods required by some strains of hybrid *Amaryllis* brought up quite a discussion. Unfortunately many amateur growers have lost bulbs due to decay during the winter months—with some strains this is a difficult problem, even with established bulbs. The trimming of all dried roots and pocketing of the bulb in sharp sand was advised, especially when fall or winter planting was undertaken, since it has been the experience of several here that root decay inevitably takes place with plantings where moist soil below 60° F remains about disturbed roots for any length of time.

Mr. Brown, whose rare charm and lovable personality makes friends of all, invited the audience to an open-house to be held at his home in Gilroy the following day, Sunday. These perennial open-house invitations are held during the height of the hybrid *Amaryllis* flowering season, and are indeed a rare treat. Apparently a number of members took his suggestion and made the 70 mile trip down the San Francisco peninsula past San Jose, for two weeks later the "Sunset Magazine", a western home and garden publication, paid tribute to his beautiful collection and hospitable reception, suggesting that others forget the chaotic troubles of the world for a spring day in the open and visit his garden. We congratulate Mr. Brown on his unique method of popularizing his splendid hobby.

VISITS TO GARDENS OF DAYLILY ENTHUSIASTS, 1942

ELMER A. CLAAR, *Illinois*

Part of March and April of the year, 1942, I spent in Florida. While there I went to visit the gardens of Mrs. Clifford C. Cole at Coconut Grove, an ardent daylily enthusiast; Mr. Wyndham Hayward, of Winter Park, our genial Secretary, and Mr. Ralph W. Wheeler, of Winter Park, our enthusiastic Treasurer. While in Orlando, the American Amaryllis Society was giving the National Amaryllis Show and there were some wonderful exhibits. The second evening of the show, I showed my moving pictures in Kodachrome of the gardens of daylily hybridizers together with the hybridizers themselves and their introductions.

In the middle of July I went to see the hybridizers in the eastern part of the United States. I visited Morgantown, West Virginia and saw the garden of Dr. L. H. Leonian; at Hyattsville, Maryland I saw Prof. J. B. S. Norton's garden; at Beltsville, Maryland, I saw Dr. Hamilton Traub's daylilies, at Chevy Chase, Maryland, I saw Mr. J. Marion Shull's daylilies; at New York I again saw the work of Dr. A. B. Stout at the New York Botanical Gardens and at Lowell, Massachusetts, I again saw the Fairmount Gardens of Mr. & Mrs. Thomas Nesmith. At Wilmette, I saw Mr. David Hall's daylilies and of course, my own.

MRS. CLIFFORD C. COLE. Mrs. Cole is an enthusiastic gardener especially interested in hybridizing daylilies. She has been crossing daylilies for some time but I have never been at her gardens when her choice hybrids were in bloom.

RALPH W. WHEELER. In my garden I am growing forty-four of Mr. Wheeler's hybrids—ten named varieties and 34 by number. None of these have bloomed typically for me so that I cannot report on them. I would estimate that Mr. Wheeler has considerably over an acre of daylilies. I arrived at Winter Park and Orlando just when the first blooms began to appear so that I did not see introductions of Mr. Wheeler and Mr. Hayward in their own gardens. Mr. Wheeler told me his favorite introduction is *Ruby Supreme*. I grow it but it has not bloomed for me.

WYNDHAM HAYWARD. I like Mr. Hayward's *Emperor Jones*, which is a flower about 6" across, dark mahogany in color with a lighter golden stripe in the mid petal which makes it very contrasty. It's tops. I liked his *Minnie* very much. It is a pink dark crimson red to mahogany with a lighter orange center and white lines around the edges of the segments. Both of these flowers are "must haves."

E. W. Yandre is a bold, flaring type of flower, fluvous bronze in shade with creped edges. *Araby* is very pleasing. It is a gold flower with a faint bronze dusted eye. *Antares* is a deep orange to purplish brick red with fluvous black overtones. *Ralph Wheeler* has a delicate golden base with a smoky fluvous marking. *Ramona* is pleasingly curved, petals and sepals somewhat brick red in color with a light golden yellow base. Dr. Traub said that his *Golden Glow* was somewhat similar to Mr. Hayward's *Sally*, but that *Sally* blooms later. However, *Sally* and *Osceola* died for me and I have not seen either of them in bloom. *William Pelham* is a fluvous brown type that I do not care for.

I am growing the following later introductions of Mr. Hayward, but I have not seen them in bloom: *Crinkles*, *Flamante*, *Irene*, *Salmon Rose*, *Antoinette*, *Dom Pedro*, *Tahiti Belle*, *Babette*, *Rene*, and *Orlando*.

DR. HAMILTON P. TRAUB. I first met Dr. Traub, our editor, in Orlando, Florida, where he was growing a large group of daylily seedlings, which he estimated to be 20,000. Dr. Traub moved to Washington, took his seedlings with him and they are now planted at the Beltsville Horticultural Experimental Station.

Among his introductions are: *Duchess of Windsor* which is pastel cream with a very light fluvous eye and very large recurving petals. *Indian Chief*, distinctive because of its size, sometimes growing as large as a 9" flower when fully expanded, has large coppery rose, long slender, recurving petals.

Granda is a red with yellow stripe in center, petals are rather narrow and the sepals are broader, somewhat darker with yellow striping. *We-kiwa* is a rich velvety red and a very fine flower. It's tops. *Dr. Stout* has petals that are rather narrow and recurving with an effect of light red dust sprinkled on them; the sepals are wider and orange with a heavier sprinkling of much lighter dust. Altogether it is very beautiful and in my opinion, will be popular for a long time. *Carnival* is a deep red with very large yellow throat. There is a yellow line in the center of the segments, the sepals are broader and darker red with a yellow line and very much twisted. The flower is very unusual. *San Juan* is a deep Spanish Wine color, very fine flower. *Victory Taierhchwang* is a Spanish wine with yellow lines down center of segments. A very fine flower. *Helen Wheeler* is the same color as Dr. Stout's *Bertrand H. Farr* but the form is different. *Mildred Orpet* has the effect of a bicolor. The sepals are narrow, peach color with a slight sprinkling of red dust. Petals are broader pastel pink with a light line in the midrib and a yellow throat. *General MacArthur* is a marvelous Vermilion Red.

In Dr. Traub's seedling beds at the Experiment Station he had some marvelous things. *Seedling* No. 156 is similar in color to *Black Falcon* but with different form. *Seedling* No. 48 is a small pastel pink with fluted edges and sepals which is very attractive. *Seedling* No. 157 is a large bright fire red with the petals small and evenly recurved, sepals larger and somewhat darker fire red with a yellow stripe in the center and twisted at the end. It is utterly lovely. *Seedling* No. 138 has the effect of a light bicolor. The petals are yellow suffused with a light red dust. The sepals are pink with yellow stripe in the middle. *Seedling* No. 249 is a general fire red in color, very evenly sized sepals, petals are fire red with crinkled edges and a yellow throat, which runs way up in the sepals to a brilliant eye zone of deeper fire red. *Seedling* No. 152 is one of the finest flowers I have ever seene. It is brilliant deep red, evnly distributed on both petals and sepals with a light yellow striped midrib which looks like it might be white. I should like to be growing this next to Mrs. Nesmith's seedling No. 38-345 and Mr. Hayward's *Emperor Jones* and one of the seedlings I saw in Dr. Leonian's beds. It has the foliage of *Cissie Guiseppi*. *Seedling* No. 250 is a brilliant red selected by Mr. Shull as outstanding.

PROF. J. B. S. NORTON. His seedlings are mostly yellows and orange. His *Garden Lady* I thought to be the best of his seedlings. It has a bi-color effect in light pastel colors. The petals are yellow with slight brushed red and raised in the center as if the edges were ironed out. The sepals are pastel pink. The color as I remember it, and as it appears in my pictures, is about the same as *Bertrand H. Farr* with a center stripe of light yellow which is almost white in the midrib of the sepal.

Mongol is a very large chrome yellow flower which is distinctive as to its size. I did not see *Louise Webster* in bloom. *Prince William* is described by Dr. Norton as a dull orange scarlet and "one of the nicest fire reds." As I grew it, it did not appear to me to be red or desirable. *Tacoma*, the Professor said, is his best bicolor but it does not compare with *Gay Troubadour*, *Harlequin* or *Festival*. The plant I received from Prof. Norton as *Woodridge* must have been mixed because the sepals were yellow, the petals dark red brown. The general effect was such that I took it out of my garden.

MR. J. MARION SHULL. *Georgio* was an utterly lovely flower, large yellow with almost white midriff on the center of the sepals. Its form could be improved. A "must have." *Gypsy Lass* impressed me as the most distinctive of Mr. Shull's introductions. It is a large orange with faint reddish flashings. The petals are orange with old gold in the center and the sepals are orange with red flashings. It has a light midriff and the edges are the most ruffled of any daylily I have seen. It has good form. Another "must have." *Musette* is an empire yellow self. *Anitra* is a light lemon yellow. Both of these I can get along without. *Seedling* No. 42-26 is a sort of a raspberry purple, unusually good form for a dark seedling. Certainly Mr. Shull should introduce this one.

DR. L. H. LEONIAN. Dr. Leonian's garden at Morgantown, West Virginia, contains some unusually fine seedlings: one which we thought could be described as a silver salmon, many deep reds, some striped, pastel colors, some reddish purple and one that I thought was especially attractive was a deep red with a light stripe down the middle. Dr. Leonian does not number or name his seedlings but at the end of the season he harvests his seeds and selects the better of his plants and sends them to Wayside Gardens, which organization is going to evaluate and later introduce those they think are worthwhile. Wayside Gardens does not see fit to secure the seedlings of the other hybridizers so I don't see how they can do a very good job in making comparisons. Before he made this present arrangement, Dr. Leonian sent me about twenty of his seedlings and three of them I have numbered. One has a more velvety texture than any other red that I have seed, the second impressed me as being somewhat similar to *Wekiwa* and *Dawn Play* so that I shall grow them next to each other to see which is the best. The third seedling was a very large red with a form like Mrs. Nesmith's *Massasoit* and it is very impressive.

DR. A. B. STOUT. Dr. A. B. Stout of the New York Botanical Garden, introduced some twenty new daylilies in 1941. Prior to 1941 he had introduced 28 clones and one species. He grows his daylilies back of the museum in an area of about two acres. From the museum it looked as

if it was about one-half planted in July, 1942. At the edge are the named varieties of daylilies of Dr. Stout and other hybridizers. Dr. Stout said no attempt had been made to secure the newer introductions of other hybridizers and I did not see any of the new ones.

Dr. Stout's Introductions Prior to 1941. Mikado—This daylily has consistently received the highest vote as being the best daylily for the last several years. Although it is a nice flower, I believe the vote is merely evidence of its wide distribution. I would prefer a dozen other Dr. Stout introductions to *Mikado*, but it is a nice flower and everyone should have it. *Roselind* is the best species I have seen. It should be in every garden. *Serenade* is a lovely flower but it is reedy. Too tall a stem for the flower and the total effect lacks proportion. *Bijou* is the first seedling introduced of the multiflora type. It is dull as compared with some of the other multiflora seedlings I have seen but is well worth the price asked for it. *Soudan* is a lovely formed flower, light yellow in color. A later *flava*. *Patricia* is a medium sized light yellow. I thought well enough of it to buy 31 plants and Dr. Stout says he thinks it an all time yellow. I have many three year old plants and I have not succeeded in growing any more than ten blooms per scape. This, also, is the experience of several other hybridizers that I know. The greenish tinge in the throat is also objected to by some. In spite of its lack of floriferousness, I think it should be in everyone's collection.

Majestic is a large orange self with a smooth finish and firm texture. Petals are ribbed and slightly ruffled at the edges. Sepals are undulated and recurving. It is also fragrant. Very fine. *Wolof* is a maroon with a clear orange throat which strikes me as a bit dull as compared with recent introductions but it is the best flower that I know in its color and price class. *Linda* has bright yellow sepals, large crinkled petals of golden yellow flecked with cinnamon, a rose eye zone in the throat gives a salmon pink effect. *Linda* is one of my favorites. *Rajah* and *Bagdad*—These flowers become less necessary to me every time I see them. *Circe* is a very fine clear yellow with an unusually fine form. *Festival*—This is one of my favorite daylilies. There are apparently two plants, somewhat different, by this name. The true *Festival* does not appear to me as being as interesting as the one with which it was mixed. It is not nearly as contrasty in coloring. This is a flower you should not miss. The petals are orange with reddish brown tinges, sepals are nearly English red with darker veins and an orange midstripe. The effect is a bicolor. A "must have." *Vulcan* has dark red coloring, greenish tinge of cadmium yellow throat, petals maroon with slightly darker midzone, sepals are maroon, petals are somewhat twisty and the sepals stiffly recurving. Several daylily enthusiasts have reported that this is not hardy. I have lost a number of plants where I planted them in preferred positions. This last year one of two came through for me. *Theron* is a dark red which approaches purplish black. I do not care much about the form of this flower but it is well worth the price asked. Color deep and fine. *Midas* is a medium size orange which I could get along without.

Waubun is a light yellow sprinkled with red in which the petals are slightly twisted in a very pleasing manner. This is a "must have." It is an intermediate bloomer. There are six plants that have been introduced by Dr. Stout that I think are especially interesting to hybridizers, but I do not think they have much garden value. *Summer* and *Fall Multiflora* species are in this class. *August Pioneer* is a medium sized orange flower whose principal merit is that it blooms quite late. *Boutonniere* is a pastel bicolor of the multiflora type whose principal merit is that it blooms late. *Autumn Prince*, a 1941 introduction, is a clear bright yellow, multiflora type, which was blooming for me after a severe frost on October 15. It is the latest thing to show bloom in the garden but it is unimpressive and I believe it will be more valuable to hybridizers than to our gardeners. I also feel this way about *Hankow*.

Dauntless—I have always liked this one but some people object to the band near the throat. *Sonny*—A lovely flower when I can get it to bloom. Very slow growing for me. *Princess*—This is a perfectly lovely pale canary yellow. A "must have."

Dr. Stout's 1941 Introductions. *Bertrand Farr* shows its *Patricia* parentage by its overlapping segment form. It is a pastel pink which I would like better if it were smoother instead of having darker coloring in the veins. A "must have" on account of its price. *Bicolor* has sepals of yellow orange with petals of pale fluvous red tinge, with rose and a midrib of yellow orange. I do not like this as well as *Cabellero*, the red coloring of which is darker and therefore, more contrasty. *Red Bird*—The dominant color approaches vermilion red with a somewhat deeper shade in the midzone. This is a "must have" and fine in every way. *Port* is a rich sprightly Brazilian red, small flower with a darker red eye zone. Very fine. *Zouave* is a rich bicolor. Petals rich red with darker midzone and sepals lighter. It bloomed for me again in the fall. I think it among the best new daylilies that I saw in 1942.

Buckeye resembles *Mikado* but it blooms three weeks earlier. I do not see why *Triumph*, *Yeldron*, *Hiawatha* and *Monarch* were introduced. *Triumph* is orange with a slight halo whose form I did not like. *Yeldron* is a small yellow orange flower whose form is somewhat like *Soudan*. I shall not propagate this one. *Hiawatha* is tangerine orange, multiflora type, blooms in June and July. I did not care for this flower. *Monarch* is a light cadmium yellow with a delicate halo which I did not care for.

Aladdin, *Baronette*, *Mignon* and *Sachem* did not bloom so I cannot report on these. *Afterglow*—This is described as caprician yellow with a pink tint. I did not care for it. *Cabellero* is a fine bicolor. The sepals are yellow with the outside edge sprinkled faint reddish. The petals are red carmine with a yellow stripe down the center. Segments are rather narrow and the form is rather straggly. I do not like it as well as *Gay Troubadour* but *Gay Troubadour* costs twice as much. Get it. It's lovely. *Symphony*—Perfectly lovely early bicolor in pastel shades; sepals almost yellow, petals greenish in throat, rose-tinted in the blade with a darker midband of light red. A "must have". *Brunette*—Chocolate colored and very early. It looked terribly dull as I grew it near some red peonies.

MRS. NESMITH'S DAYLILIES. *Introductions Prior to 1940. Burmah*—Late blooming orange overlaid with rose and copper. Mrs. Nesmith has much better in this class. *Dawn Play*—One of the finest Nesmith introductions; deep velvety rose with golden throat and golden midriff. One of the finest introductions that I know. *Dolly Varden*—Throat of creamy yellow, coral pink sepals and petals with slight lines of rose. This is a very nice pastel pink. *Heather Rose*—Pastel pink with a golden throat. Very nice flower. Large open flaring type. *Morocco Red*—Good velvety maroon red. Rich orange cup. *Persian Princess*—Petals deep velvety red with overflush of purple. Sepals a shade lighter. Very nice. *Starlight*—Very pale yellow, large delightfully fluted flower. One of the nicest of the creams. Should be compared with Sass's *Moonbeam* and Mrs. Popor's *Old Ivory* and Dr. Stout's *Princess*. Mrs. Nesmith prefers her *Canari* to this one. I did not see in bloom *Petra*, *Pink Lustre* or *Sweet Briar*.

1940 *Introductions*. *Amulette* and *Antimony* did not bloom for me. *Canari*—This is a very nice pale yellow with a smooth satiny finish. Perfectly lovely. *China Sea*—Light yellow with a salmon flush halo. *Coralline* and *Debonnaire*—I do not remember these although I grew them. *Dragon*—Sort of a rosy color with frilled petals and sepals, cadmium orange cup. Many of her named varieties and seedlings I like better than this one. *Gay Lady*—An early light chinese yellow which blooms for a long time. I do not need it. *Massasoit*—If you like them tall and large, you will like this one. Petals and sepals are ruffled at the edges. Sepals are reddish copper and the petals the same color with a touch of Indian red. *Matador*—Rich mahogany, sepals same color but not as velvety as the petals. Mr. Hall liked this the best of all the Nesmith plants that I am growing. *Moonray*—Pale yellow with a red halo. Petals are waved. Small. Form is very irregular. I cannot share Mrs. Nesmith's enthusiasm about this flower. *Royalty*—Maroon purple chrome yellow throat, velvety purple sheen. One of the best of this color class that I have seen.

1941 *Introductions*. *Autumn Red* has a nice color. Late bloomer with a yellow throat and a light line at the midriff of the sepals. *Bittersweet*—Bittersweet orange flushed with coral which gives the appearance of a rose color, white midriff and with white on the edges of the three petals. Golden throat. *Black Falcon*—This is a large star shaped type of flower of very dark purple color with a pale canary yellow throat. The edges of the flower are wavy. Segments are recurving. It is the best thing I have seen in its color class. *Bright Melody*—a red with flecks and dots of golden henna. Very nice. *Carmencita*—a large, flaring flower of rosy amaranth purple with a pale yellow center. Light midriff on the petals. *Charioteer*—throat yellow, sepals Brazilian red and cadmium yellow. The petals are the same color fluted at tips and with a yellow midriff. Flower has good form. *Debutante*—a dainty pink bicolor. Petals are smooth light pink and the sepals creamy yellow, pale yellow throat that is topped by a slightly deeper pink flush. Very lovely. *Gay Troubadour* is my favorite bicolor. Petals are creamy yellow with outside edges burnished with bright Indian red, the sepals

are cherry red, almost white midriff and a yellow throat. Form is sort of spidery or straggly, but is a lovely flower. *Purple Elf*—Dark maroon purple almost black. It is a small flower overlapping segments like *Circe*. *Regal Lady*—Bicolor. Petals rose with a deeper rose zone bordering the rim of pale yellow cup. Sepals are cream yellow faintly flushed with rose, giving the effect of a bicolor. *Su-Lin*—Petals are a light pink. Sepals light yellow. Very lovely bicolor. Especially liked by the ladies. *Thorobred*—Dark red with a yellow heart which I did not care much for. The form is poor.

1942 Introductions. *Crimson Clover* is a rose with a deep rose halo. Petals have a slightly raised midriff. The sepals are recurving and bordered with a lighter rose. *Honey Red Head*—The flowers are open, bright rose red, texture border of pale cream yellow around petals and sepals. Has a golden throat. Very good form. Utterly lovely. *Lustrous*—a large flower with a yellow throat, petals are pink pastel, sepals are also pink pastel and pinched. Very nice. *Noonday*—a light cadmium yellow self which I did not care very much about. *Purple Finch*—Purplish red with darker eye zone, yellow throat. When I saw this flower it was not at its best being somewhat pinched. *Purple Moor*—Dark purple with a deep yellow throat, segments pointed like *Theron*. *Royal Ruby*—Brilliant crimson red. Very smoothly finished, nicely branched. Really a gorgeous flower. TOPS.

MRS. NESMITH'S SEEDLINGS. Among the seedlings of Mrs. Nesmith that I like best, 39-129, deep mahogany with unusually fine form. 39-127, a medium sized flower of bright fire red with a throat of gold. Very contrasty. It will be named. 39-185 is a purple flower, very smooth with a form like that of Dr. Stout's *Circe*. 38-345 is one of the best of Mrs. Nesmith's seedlings. Red with an almost white line down the center. 42-28 is a pink that I like. 37-40 is a flower very similar to Dr. Traub's introduction *Dr. Stout*. Lovely. 42-40—a flower of raspberry color. 39-61 is a pastel pink which is very lovely. 41-133 is a pink with a deep red marking near a very yellow throat. 38-302 is a large flower with a light stripe down the center. 41-136 is a lovely pink with light sepals.

PROF. JOHN V. WATKINS. I am growing Prof. Watkins, 1942 introductions, *Kanapaha* and *Swan*, but I have not seen them in bloom. I am also growing his *Mrs. John J. Tigert* which I did not care for. To me it is just another fulvous daylily. However, I understand Dr. Watkins did not select this flower until after it had been grown four years so that I no doubt have not seen it bloom typically.

HANS SASS. Mr. Sass's *Golden West*, *Star of Gold*, *Hesperus*, *Nebraska*, *Moonbeam*, are still among the finest in their specific color class. His new introduction *Revolute* is a large imperial yellow with very good form. His seedling 45-40 is a big orange, the segments of which are recurving in a manner which gives it a very lovely form. Mr. Sass is particularly careful in selecting seedlings which have good branching. In a number of *Hesperus*, I have counted over fifty flowers on one scape. *Hesperus* is my favorite yellow daylily. It is a "must have." *Dorothy McDade*, a Sass Seedling, is by far the best late blooming daylily that I have seen.

DAVID HALL. His No. 39-2 is a twisted flower like *Taruga* but appears to be a more impressive flower than *Taruga* from comparison made from my pictures. His 39-7 is an exceptionally well branched yellow which produced up to 54 flowers per scape. The flowers were 7" across and the flower was a complete monotone—even the throat was the same color as the outside of the segment. It will compare favorably with any of the yellows.

ERNEST PLOUF. Of all of Mr. Plouf's introductions the only ones that I am growing is *Craemore Henna* which I thought was very nice and *Craemore Ruby* which did not bloom for me, but I understand it is his best introduction.

MRS. POPOR. Her *Old Ivory* was perfectly lovely this year. It was the only one of this lady's seedlings that bloomed for me this year.

F. F. DONAHUE. *Golden Manny* was a distinct disappointment to me. It is just another yellow with no special reason for its introduction. I do not have any of the other introductions of Mr. Donahue.

H. F. FISHER. The only introduction I have of Mr. Fisher's is his bicolor *Chisea* which is not nearly as good as *Gay Troubadour*, *Festival*, *Bicolor* or *Cabellero*.

GEORGE YELD. His *Apricot*, which was the first daylily seedling of which we have any record still is an excellent plant. *Sovereign* is almost a duplicate of *Gold Dust*. These are both excellent plants. *Tangerine* is a good early orange and *Estmere* is still good. Among the other seedlings of Mr. Yeld which are still standard are *Sirius*, *Radiant* and the perfectly lovely *Winsome*.

AMOS PERRY. Of Perry's introductions, *Berenice* is nice; *Byng of Vimy* is a large loose type of flower; *Flavia* and *Golden Byng of Vimy* are large flowers of the same shape as *Byng of Vimy*; Mr. Perry has introduced entirely too many flowers that are very, very similar. I suppose this is largely due to the fact that he has been introducing them for a long time. I recommend that you see the other Perry introductions before you purchase them for the catalog descriptions are not always helpful.

CHARLES BETSCHER. I did not get to visit Mr. Betscher this year but his *Earliana* continues to be the finest early yellow that I have seen. His *Gloriana* is the finest orange intermediate and *Anna Betscher* is another "must have" of this gentleman. His *Golden Dream* and *J. A. Crawford* are good standard plants. Nearly all the rest of his introductions are yellows or oranges and very similar.

ELMER A. CLAAR'S SEEDLINGS. I do not intend to introduce any of my seedlings until I have had more time to appraise them. Out of several thousand that I have grown, I have named the following. *Prima* which is a multiflora type with a much more intense and vivid reddish color than any I have seen. *Twinkle Eye* which is an intermediate type with an eye zone which is a light bright red, and definitely distinctive. The over-all effect of the flower is pastel pink. It is distinctive because of the time of bloom and a good flower, in my opinion, at any time. *So Big* is distinctive because it is so little, yellow in color, trumpet shaped with flowers no bigger than 1½" across and the sepals are very markedly

waved. *Vladimir Horowitz*—I have tentatively named a big red seedling Vladimir Horowitz with the consent of this great pianist, but I am not definitely persuaded this is good enough to name after Mr. Horowitz. I shall reserve the name and watch this flower another year. *Cadet* is a pink I thought very well of. *Buddie* is an unusually fine multiflora type. *Flamingo* is a rose colored seedling I thought well of.

H. M. RUSSELL. I am growing the following daylilies of Mr. Russell, but none of them have bloomed for me as yet so I cannot report on them this year. *Queen of Gonzales*, *Painted Lady*, *Mrs. B. F. Bonner*, *Purple Waters*, *Purple Flash*, *Seven Seas*, *Warpath*, *Annis Victoria Russell*, *Spitfire*, *Black Prince* and *Sylvia*.

CLINT MCDADE. I am growing *Queen Bess* and *Mermaid* but they have not bloomed for me as yet so I cannot report on them as yet.

ALSTROEMERID KODACHROMES

Mr. Harry L. Stinson is preparing a comprehensive set of Kodachrome color transparencies of Alstromeria and Bomarea, mounted between glass, for lantern projection. When this set is completed, it will be available for loan to responsible officers of garden societies and clubs for public showing. The service will be free, but postage and insurance must be paid both ways.

Similar comprehensive sets will be prepared for the amaryllids and will be loaned for public showing.

2. COLOR DESCRIPTION

DRYING FLOWERS IN THREE DIMENSIONS

FRANCES R. WILLIAMS, *Massachusetts*

Drying flowers in three dimensions to keep their natural shape and color is a fascinating hobby. The method is to completely cover the flower and leaves with some powder for three weeks, leaving it at ordinary room temperature. The results are often amazing and unexpected, and you never know what you will find at the end of the drying period.

Many flowers will keep their natural shape and color and appear as if just picked, while some will lose all original color. The success seems to depend upon whether the color is in the cell structure of the flower or whether the color is in the liquid within the cell, and whether the color will disappear when dried. Many chemical processes enter into the final results. A lovely snapdragon of vivid pink or yellow will look almost as it did three weeks before when you put the living plant away to dry. A *Crimson Bedder* nicotiana will turn from its dark, rich red to a dull dark gray. A *Heavenly Blue* morning glory changes to a bright pink.

At the large herbaria of the colleges, they tell you that the faster you dry the better color you are likely to have in your dried, flattened plant specimens. In 1937, I found chicory blossoms a hard thing to press, as they shrivel quickly and lose their blue color. But I remember how I used alum to put on muskrat skins, that I had dried as a child, and I added some alum on top of the chicory that I was pressing. I was not much impressed with the result, though I imagined it helped a little. The next year I tried again with about the same result.

In 1939, I tried alum on some gardenias that I was trying to press. Some gardenias I pressed with nothing added. The results were better with for the flower did not turn that dark brown, that gardenias usually turn when pressed, nor has it turned to date, over three years later.

I happened to watch a plaster cast being made, and was amazed at the way the plaster took up the moisture. When I got home, I took the last partly faded gardenia and found in the cellar a very little plaster of Paris. This I threw over the sad gardenia and left it on a shelf in the cellar, of all damp places, for what was, by chance, about three weeks. When I finally took the gardenia out of the plaster of Paris, it was just about as I had put it in,—a light cream color and in excellent shape, though a little shrunken. It certainly was a surprise to find anything like that.

From that start, I went on to other things. Skunk cabbage was my next venture. I dried skunk cabbage flowers in alum and in plaster of Paris. They came out in excellent shape, and color. A *Marica* flower came out well in 1939, and is still in good condition. Some Narcissus were fairly successful, and held well for several months. I had poor results with *Iris*. Larkspur kept excellent shape and color. I was still using plaster of Paris and alum, separately or mixed. In the summer of 1939, a pharmacist suggested borax. That seemed to do a much better job, and then I started to try about everything on the kitchen shelf, and have tried almost everything that anyone has suggested to me.

White Plantain-lilies, dried two and a half years ago, are still white. The reds of marigolds and carnations dulled somewhat, while a handsome red and yellow chrysanthemum turned dirty, light brown. Two and a half years ago, in 1939, I did some stalks of snapdragons, and they have kept well, the yellow has held better color than the pink. Part of the time these snapdragons have been shut up in a box, and for several weeks they were at Horticultural Hall, Boston, Mass., in the Library for an exhibit, in their box with cellophane over the top.

There seems to be a certain toughness to flowers dried in some of these materials, as if they absorbed something into their cell structure. They have seemed to stand more handling than some that were dried with nothing added. Observation over a period of three years indicates that the specimens dried in plaster of Paris and talcum powder are more pliable than those dried in borax. After a few years the plants dried in borax are becoming very fragile and crumble readily if pressed.

Last summer I dried a number of plants in borax to show different flower forms. I took a dozen of these from Boston to Chattanooga last December by train, and brought them back part way by train and part way by plane. They came through well, and are in good condition. This shows that they will stand a good deal of handling, as they were shown several times on the way.

One plant I put in powder in a tin pan, and applied bottom heat. This made it very brittle. Plants should be dried slowly. I generally dry flowers three weeks, and mushrooms six weeks.

I have tried several methods—drying and pressing at the same time with powders, or drying in three dimensions in powders and pressing flat afterward, so that the specimens could go in an herbarium. Those pressed with borax are too crumbly, and I shall try more in plaster of Paris and talcum powder. These have helped keep the white of *Nicotiana*, roses and *Actinidia*.

If the specimens are stuck in a little lump of plastacine, they will stand upright for an exhibit. The plastacine can be pressed into a saucer, before the flower is put into it.

I generally keep my specimens shut up in cardboard boxes or in cellophane boxes. When the moisture of the air gets at some flowers, especially sweet peas and *Narcissus*, they droop and fade. I painted some sweet peas with several transparent liquids to try to keep the moisture away so that they would not shrivel and droop. Duco cement mixed with banana oil has kept a sweet pea blossom for over a year. I painted this on with a small camel's hair brush. The white sweet pea blossom is cream color with wavy petals as in fresh specimens. Japanese chrysanthemums, pond-lilies, milkweed and others came out well and were painted with liquid court-plaster. They are holding well also.

I wonder if some flowers are acid and some alkaline, and if they ought to have a corresponding powder. Some red flowers tested acid, and the blue did not seem acid, but nearer neutral. I like borax for an alkaline powder. For a neutral I like Fuller's earth or talcum powder and for an acid powder. I am also trying boric acid powder and salicylic acid.

Hemerocallis fulva blossoms, apparently identical, were dried in several different powders and turned various shades of orange or orange-

red. Twelve red begonia flowers tested with litmus paper gave reactions as acid as vinegar. All turned various tones of sand color and some had tones of pink. The reds generally vanish in the drying, and the flower is left sand color, or a very dull reddish.

I have dried over 200 specimens in various materials. During this past winter, I made transparencies of cellophane, and tried dried flowers in the window in the transparencies. Larkspur has been in full sun all winter, in the window and neither the bloom nor leaf has changed color. A goldenrod as a transparency lost its bright yellow in three weeks in the sun, but has kept a pleasant buff all winter. *Chenopidium Botrys* in three weeks in the sun turned very light green-gray.

To dry a flower in three dimensions, take a cardboard box, larger than the flower and several inches high. Put in the box about half an inch of the drying powder—Make a mound of powder at the spot that will be below the flower. Lay the flower on this mound, so that it is up in the air and not being flattened by lying on the bottom of the box. With a spoon or the hand put powder very carefully all around under the flower. When the powder is half way up, put a little powder in the flower. A very little powder spreads the flower open more than is natural so do not put in much at first. Keep putting the powder about the flower and into it until it is completely covered and with about a half inch of powder over the flower. It will dry the way you fix it.

Leave this box with the flower in it in a room at ordinary temperature for three weeks. At the end of that time uncover very carefully. A box that will undo at the corners, so that the sides will open out flat, will let the powder fall away from the plant on the sides, and make it much easier to remove the rest of the powder, or to pull the flower out of the powder.

Of what use are dried flowers? I do think that they may be useful for class work and for educational exhibits. One town is using dried ragweed as an exhibit, in their attempts to eliminate this weed. I have been using transparent corsage boxes to show off the flowers. Such boxes show off the flowers more effectively, and protect them when passed about. Dried flowers are not the thing to use in place of bouquets and in flower arrangements. One day I looked at some artificial flowers, and it seemed to me that to look real, such flowers must be quite artistic, not made as an exact copy, but with much left to the imagination, to give the impression only, of the plants that are imitated.

If these dried flowers can be used for formal, artificial decoration, as perhaps in a church, or as models for class study and for transparencies, fitting panes of the windows, then they will serve a distinctly useful purpose. I know of invalids in a hospital who have enjoyed holding the light transparencies and looking at the flowers. So don't try to use these flowers in place of the fresh flowers. If they meet some especial need, they may be worth having. One person said they reminded him of the old faded flowers in the bridal wreath of Miss Havisham, in Dickens "Great Expectations." Another said they were ghosts, others said they were mummified, or crystalized, or pickled, or embalmed, or petrified, dessicated, and dehydrated.

I have never yet found a name for them so they are just flowers dried in three dimensions.



Harry L. Stinson, Seattle, Washington

The pink forms of Alstroemeria Ligtu

3. DESCRIPTION, CLASSIFICATION AND PHYLOGENY

ALSTROEMERIDS CULTIVATED IN THE UNITED STATES

HARRY L. STINSON, *Washington*

To the general gardening public the name of R. P. Louis Feuillet has little or no particular significance but to the "Alstroemerian" it is the introduction to a long sequence of events relating to the Peruvian Lillies. Feuillet during the years from 1707 to 1712 travelled throughout South America and recorded his discoveries in a two volume "Journal of the Physical, Mathematical and Botanical Observations in the West Indies and South America." In this journal are to be found the descriptions of the first three Peruvian Lilies ever to be recorded. The identity of these plants was entirely unknown to our travelling botanist and he unwittingly mistook them for new species of *Hemerocallis* which he probably cultivated in his own home garden.

He prefaces each of the three descriptions briefly with a sentence: 1st. A hemerocallis with purplish and streaked flowers, commonly known as *Ligtu* (See Plate 226.). 2nd. A hemerocallis with purplish and spotted flowers, commonly called *Pelegrina*. 3rd. A climbing hemerocallis with purple flowers, called *Salsilla*. These today are cultivated respectively in our gardens as *Alstroemeria Ligtu*, (?); *A. pelegrina*; and *Bomarea salsilla*.

Feuillet published his journal in 1714 and Linnaeus in 1762 commented that it was a comparatively rare book even at that time. For the pleasure and information of those who might not have access to a copy of it, and for the benefit of those students of the Alstroemerids who are interested in ascertaining the true *A. Ligtu*, which he describes, I am here taking the liberty of quoting translated excerpts from Feuillet's original Journal.

The first species which he described was, "A hemerocallis with purplish and streaked flowers, commonly known as *Ligtu*."

"The roots of this plant go obliquely deep into the soil, it has on its length some knots (thickened places) covered with some short hairs, it is round, three lines thick, and covered with a whitish skin."

"The stem arises obliquely to a height of a foot, following the same direction as its roots; it is winged, (I am of the opinion that *winged* in this instance means leafed: "*ailée*", in the old French did carry the meaning of "having leaves like wings", and not winged in the modern botanical sense), covered with a reddish-brown bark, round, crowned with six or seven leaves, from between which emerge as many branches bearing several flowers at their summits."

"The leaves which are borne the length of the stem are placed on all sides, they embrace half the stem by their bases, their length is in the vicinity of two and three quarter (2-3/4ths.) inches, their width some five lines, they are bright green, end in a point, and are traversed throughout their entire length by several little ribs which all originate at the base, and continue till they end themselves at the extremity of the leaf."

“The flowers are carried on the young fruit (ovary) at the end of a beautiful green peduncle. This young fruit is ridged on its length with five ribs, (Why did Feuillet write five?), and they bear a flower of a beautiful red, which is divided into six parts, two of which are streaked by some white bands which form acute angles with the rib of the same color which traverse their length. These two are narrower and more acute than the other four, which are one and five sixths ($1\frac{5}{6}$ ths.) inches long from the point where they separate, and nine lines wide; I have not seen the fruit, having been obliged to leave before its maturity.

“This plant is found along streams, I took notice of this one along the river which passes through the center of the village of Concepción in the Royalty of Chile”.

The second species which Feuillet described is *A. pelegrina* or Lily of the Incas, or Lily of Lima. This description the author prefaced with a short and somewhat fanciful account of the gardens of the Inca kings which is of interest to all gardeners.

“The flower of this plant merits by its beauty to have had a place in the gardens of the Incas, and perhaps we would have seen it there in its season if we should have lived in their times. The grounds of the gardens of these Great Kings had this advantage over others, as spring seemed to be continual and to maintain the plants in all their beauty; but as soon as they started to wither away and Nature seemed to take a rest, there was substituted in their place some new plants formed from gold and silver which the artisan had imitated quite perfectly, and which maintained the grandeur and magnificence of these sovereigns. The trees made of this precious metal formed long walks. The fields were filled with Mais, of which the tip ends of the stems, the flowers, and the ears were of gold and all the remainder of silver, the whole soldered together, were as marvelous as the centuries to come will ever see. And the only thing lacking to the Incas was the knowledge of the true God, whom we worship, to make them the most perfect Prince of Mankind.”

Since there is no confusion as to the identity of this species I shall not give the balance of the description of it here. Likewise I shall omit the description of *Bomarea salsilla*.

Undoubtedly travel in this new, vast, and unexplored country had brought so many new and unknown plants to the attention of Father Feuillet that the discovery and recording of a few more or less became such a routine matter that they failed to elicit much enthusiasm from the weary traveller, otherwise he could have facilitated the work of the present day followers a great deal if he had given his descriptions in greater detail, but how was he to know that his discoveries were to be the first of a long list of Peruvian Lilies yet to be found and described?

The next account we find of the alstroemerias is in Linnaeus' *Amoenitates Academicae*, under the title of “*Alstroemeria Planta*”. And again permit me to make a translation from the above reference for your general information, as it explains just how and where it

happened to be found in Spain. I quote, "The years taken up by these academic tasks had hardly been completed, when Don Claudius (Alstroemer), already eminent among those interested in the Natural Sciences, prepared himself for a journey, to wander over the ever-flowering lands of Europe, I refer to Spain, France, Italy and others. Certain of his opinions and purposes, he set out on the sea and with favorable winds arrived on the 28th. of April of the next year (1754) at the port of Gaditanus (now the city of Cadiz), Spain. Scarcely had he set foot upon the land, when at the home of the Swedish Consul, Don Bellman, he came in contact with a whole bunch, of a certain liliaceous plant of very rare beauty, and of such a singular structure that he was unable to refer it by any method to a genus thus far known. Inspired with delight of such a remarkable plant, he was unable to calm himself until he had contracted a much closer friendship and intimacy with it. Also, in this same city at a fortunate time he met a certain Noble Matron, to whom, sometime before, it had been sent by her husband while residing in the Peru of America.

"Now his first care was, to sketch such a pleasing plant, to describe and dry a cut flower so that he might present all these to his former most esteemed instructor in Natural Science. (Alstroemer was a student under Linnaeus). And furthermore, after the elapse of a certain interval of time he was able to secure fertile seeds, which he likewise sent. I testify to have seen how pleased his Noble Chief was to have received such a rare gift from his most beloved Alstroemer, how carefully he immediately entrusted the seeds to the soil, which by care and attention he conducted through the subsequent mild winter in a special propagating bed; until in the end he displayed the most delightful (plant) in the Academy garden and eventually (it) produced mature seeds. This strange plant, the first to have been seen by us, has been distributed by the Academy gardner and by us all under the name of Alstroemer's Plant or Alstroemer's Lily."

"This plant has been given the name of *Hemerocallis*, so as to correspond to the following, but in reality the name *Hemerocallis* was introduced a short time ago to designate the Genus of the Asphodel Lily of Tournefort, hence this name cannot be admitted in as much as it applies to both. And now this plant, of a separate family, should have a distinct Generic Name, lest it be confused with the plants of a different genus. No synonyms are left, and for this reason a new name must be given; and since we owe this to Don Claudius Alstroemer; who found it, described it, and made a drawing of it, and introduced it correctly defined to the botanical world, and shared it with the gardens of Europe,—What prohibits us then from naming this plant, ALSTROEMERIA?"

Space prohibits giving the entire translation of Linnaeus' discussion on *Alstroemeria* as interesting as it may be. Also it might be found of little interest to those members not particularly acquainted with this branch of the amaryllids.

Linnaeus accepts the three *alstroemerias* listed by Feuillet in his Journal, but gives his entire attention to *A. pelegrina* which he says "will be a favorite". No reference is made to *A. Ligtu* and *A. (Bomarea) salsilla* as having been found by Alstroemer under cultivation in Spain. Jacquin asserts that Linnaeus made it a practice not to describe plants which he had not seen. So evidently these two were not in cultivation in Europe at this time. Herbert in his *Amaryllidaceae* states that Linnaeus confounded *A. caryophyllaea* and *B. edulis* for the two in question. I have just received material from the Library in Cincinnati, Ohio, which shows *A. Ligtu* of Linnaeus, Jr. in his supplement, page 207, which is certainly not the *A. Ligtu* which Feuillet described.

The Index Kewensis may be taken as the most authoritative tabulation of the recorded species to date. In it and its nine supplements are listed over a hundred species. Linnaeus started with the three of Feuillet, and his son in his supplement adds *A. pulchella* and *A. (Bomarea) multiflora*. Ruiz and Pavon enumerate in their *Flowers of Peru and Chile* some six species of *Alstroemeria* and seventeen species of what are now classed as *Bomarea*. William Herbert probably had the most up-to-date collection of them at that time. In his *Amaryllidaceae* (1837) he describes twenty-nine species and many varieties of the *Alstroemeria* alone. Many of which he also illustrates, and gives some pertinent information concerning them from his personal observation. About a decade after Herbert's *Amaryllidaceae*, Kunth came out with his *Enumeratio* and gives an excellent compilation of the then known species. The number of species has now grown to thirty-nine. Baker in his *Handbook of the Amaryllideae* (1888) admits that he made no search of the literature but merely studied the Herbarium specimens and rewrote the descriptions. Subsequent writers accuse Baker of not being careful enough in his observations and letting many minute points escape his notice.

A brief discussion of some of the species actually being grown in our gardens at Seattle may be of interest to our members not familiar with them. These plants have been collected by my many friends and correspondents in this and many foreign countries who have been so very generous in sharing with me their plants for study and observation. Others have been imported from England, Australia, Holland, Germany, Ireland, Chile, Costa Rica and Colombia.

At this point it may not be out of place to acknowledge to the members of the Amaryllis Society the deep debt of gratitude I owe to my many friends and correspondents who have been of great assistance to me in this interesting avocational pursuit—to Mr. Hayward for originally mentioning the need of a study of this little known family of plants, the late Dr. Griffith who supplied the first tubers and started the collection, the Messrs. James, Orpet, Brydon, Houdyshel, Vollmer, McCoy, and Hannibal, who have been most unselfish in sharing with me their good fortune when receiving new seeds, Mr. C. A. Weddigen, secretary to The Mens Horticultural Society of Cincinnati, Ohio, for looking up and copying valuable material from very old botanical journals, Senor Don Hernando G. Barriga of Bogota, Colombia, and Senor Don Salvador

Izquierdo of Santiago, Chile, who put themselves to much trouble and inconvenience to secure seeds of the alstroemerids indigenous to their respective countries.

Linnaeus wrote, that "out of this set of three companions, our *Alstroemeria pelegrina* will be a favorite". This is the true Lily of the Incas (Inca Lilies) or Lily of Lima, and to Mr. James goes the recognition of apparently being the first to import this beautiful flower to this country about 1932. There are two varieties of this in general cultivation. The *type* is a light lavender with green on the outer tips of the sepals and in their center is a large area of reddish-lavender, the two upper petals have the same light lavender on the outer portion while the inner portion is white with a beautiful flush of golden yellow, and over the entire are many spots and dashes of dark maroon. The variety *alba* is pure white over cast with a tinge of chartreuse green in the center of the sepals and a little toward the outer ends also a flush of golden yellow in the center of the two upper petals. The flowers are open to a diameter of about two and a half inches and are carried on stems from one and a half to two feet high. In the frost free regions they may be grown out in the open ground, but with us they must be grown in a coldframe which is covered with glass and heated to exclude all frost. The tubers of this species are quite long and fleshy and the plant does not seem to resent being grown in pots. This is the plant which Ruiz and Pavon write about as being "carefully cultivated in earthen pots in the gardens of America and Spain for its beautiful flowers", and in their observations they explain in detail how the Chileans used the tubers to make a farinaceous material which was used in the diet of invalids suffering from stomach ailments. This material also was dried and stored for future use.

A great deal of confusion and perplexity has existed constantly in the minds of botanist and horticulturist as to just what plant Father Feuillet had before him when he described his famous *A. Ligtu*. It seems odd that with all the exploration and botanical work which has been done over this same territory for the past two centuries, no plant has since been found that perfectly fits his description. Ruiz and Pavon in their "Flowers of Peru and Chile" give a description of their *A. Ligta*, (this is spelled LIGTA) which they consider as being synonymous with the *A. Ligtu* of Linnaeus Junior's Supplement, page 207. This plant definitely is not the *A. Ligtu* of Feuillet. According to both Prof. Lindley in Bot. Reg. 1844, t. 58. Misc. 6. and Les Liliacées, by P. J. Redouté, this *A. Ligtu* is *A. caryophyllaea* of Jaquin.

At the end of Ruiz and Pavon's description of their *A. Ligta*, they append an observation that "Sketches and dried specimens of this and of the subsequent species (*A. revoluta*) which are indigenous to the Royalty of Chile, we have lost in some of our well remembered shipwrecks, therefore we do not give drawings of them here". This loss is most unfortunate for us as it might have been the one thing which would have positively identified the plant which Feuillet so poorly described and illustrated.

A closer examination of his description convinces me that we do not have the true *A. Ligtu* in cultivation in this country at this time. (See Plates 226 and 227.) To begin with he states that it "arises obliquely to a height of one foot". This growing out obliquely is definitely characteristic of the species *A. haemantha* and its many varieties. None of the plants being grown under this name (*A. Ligtu*) are as dwarf as one foot, but grow to a height of three to five feet. Although under cultural conditions they might be expected to grow more robust than in the wild state. Feuillet says further that "the stem is winged (ailée). If this were true it would definitely set it out as distinct, but no species which I have examined has shown any tendency to be winged and no authority since mentions any such phenomenon. Consequently I have come to the conclusion that it undoubtedly is the old French way of saying that the stem bears leaves, and not "winged" as the term is used in modern botany. Furthermore, the stems are "covered with a reddish bark". Strangely enough, none of the plants which I have growing under this name have this color of bark, but *A. haemantha*, and here and there throughout the planting of *A. chilensis* are many which do have reddish bark.

His description of the leaves is too general to be of specific value in identification. Neither Feuillet nor Ruiz and Pavon say a single word about the leaves being ciliated on their edges and yet it is so evident upon all the so called *A. Ligtu* specimens examined by me that they either overlooked it completely or else described other plants. According to both Herbert and Kunth the matter of ciliation definitely places them in the *A. haemantha* group. Schultes in his *Systema Vegetabilium*, page 735, did not help the situation any when he describes a variety of *A. Ligtu* with ciliated leaves. I have this one (from seeds which I received under the name of *A. Ligtu*) but it is not Feuillet's. Dr. Sims, in the *Botanical Magazine*, t. 2353, further complicates matters by confusing *A. haemantha* with *A. pulchella* of Linnaeus Junior. Again referring to Feuillet's description we find that he probably unintentionally says that the capsule has five ribs instead of the usual six.

The so called *A. Ligtu* grows from three to five feet high with leaves (ciliated) scattered along the stem, which gradually start defoliating as the flowers begin to open. The flowering stems terminate in an umbel of three to fifteen peduncles which bear three to five florets each. The flowers are about two inches long and one and three quarter inches across and come in all the shades of pink. The sepals are a solid color while the two upper petals have the same color as the sepals on their tips, immediately under this is a large area of golden yellow, this merges into a lighter shade of pink, these petals are streaked with dashes of deep maroon which converge toward the midrib and give the impression that they are winking at you. As a cut flower for flower arrangements or corsage work they are excellent. Whether we have the true *A. Ligtu* or not should not prevent our enjoyment of these beautiful flowers.

Since the appearance of Linnaeus Junior's supplement to *Species Plantarum*, the name *pulchella* has been a favorite appellation and has been applied to several species. I must admit that it is euphonic and ought to be given to a beautiful flower. It was first used by Linnaeus Junior in connection with a plant, a drawing of which Alstroemer had sent to him, but which plant he had never seen. Herbert is of the opinion that a badly mutilated specimen in the Banks Herbarium might possibly be this same plant which Linnaeus Junior described, and according to all reports has not been again identified.

This name is now erroneously applied to a species which we cultivate in our gardens, and which should be called *A. psittacina*, or "Parrot Alstroemeria". The main volume of *Index Kewensis* inadvertently gives *A. pulchella* as being synonymous with *A. psittacina*. And Baker falls in the same error, which he surely would not have done if he had gone to the trouble of looking up the literature which he gives as references. The eighth supplement to the *Index* corrects the mistake. *A. psittacina* was correctly described by Lehmann in *Cat., Hort., Hamb.*, in 1826. Herbert gives it correctly in his *Amaryllidaceae*; Prof. Lindley correctly describes and illustrates it in *Bot. Mag. t. 1540*; also in *Sweet's British Flower Garden. n. s. t. 15.*; Hooker in *Bot., Magazine, t., 3033*. I am not able at this time to account for this error and it seems to persist only in America, as it is not found in foreign catalogs as *A. pulchella*.

A. psittacina is not perfectly hardy in our gardens here on Puget Sound, and we have to keep it planted in a glass covered cold frame during the severe winter. Being indigenous to Brazil it would prefer a warmer climate than our long cool damp winter months. The plant grows about two feet high and has an umbel of five or six usually simple peduncles, if they branch it is well below the center of the peduncle. The flower is about two inches long and inclined to be somewhat nodding or slightly above the horizontal. It is tubular in shape with the perianth segments unequal in length, the upper sepal being the longest and slightly incurved at the tip. The color is most striking, being a dark purplish red at the base of the segments, gradually changing to a brilliant red upwards toward the tips, which is a vivid green. On the inside all six segments are punctuated with many little black dots. The stamens evince an interesting precaution to self pollinated—as they mature and before the pistil is receptive they curve downward and outward so as to be completely out of the way of invading bees and humming birds seeking the honey hidden away in tubular bases of the two upper petals. This species will probably never achieve any great popularity among gardeners, but should be valuable in breeding experiments.

Another species of similar characters is the *A. brasiliensis*. It seems to be somewhat hardier and survives outdoors. It grows about eighteen inches high. Flowers about the same shape as *A. psittacina* and of a rich wine red color without any green on the tips of the segments.

A. inodora, which was distributed a few years ago by the U. S. Dept. of Agriculture, turned out to be *A. psittacina*, and did not agree with the description or illustration in Herbert's *Amaryllidaceae*. One plant had variegated leaves with a white margin.

Some tubers imported from Australia under the name of *A. braziliensis* turned out to be *A. psittacina*, and this bears out a footnote in Kunth's Enumeratio under this species that C. Bouchée states that "there was in cultivation in the Royal Horticultural Gardens of Berlin a species *A. braziliensis* which was really *A. psittacina*".

There is another species with flowers about the same size and shape as these tubular species but it is classed with *Bomarea*. It grows to a height of about three feet and its flowers are a sordid yellow dotted on the inside with black dots, tubular and with that characteristic incurved upper perianth segment. The stems show no tendency to climb like the bomareas but are rather stiff and erect. However it answers the description of *B. campaniflora* as given and illustrated by Handel-Mazzetti. It is not likely that this species will ever be a commercial sort, but is interesting as a botanical species and for breeding experiments. The seed of this plant (See Plate 229.) were kindly sent by our friend Major Pam to our Secretary, Mr. Hayward.

While this latter species seems to want the full sun, Major Pam also sent seeds of another species which wants treatment similar to that given to orchids. It is *A. nemorosa*, and answers the description of it as given by Gardner in Bot. Mag. t. 3958. It is evergreen and blooms during July and August. The flowering stem is about two feet high with the stem leaves reduced to long scales and a large rosette of leaves at the top in the form of a involucre, with three to five simple peduncles arising from the center of this. The flower is about two inches long, tubular, but expands at the end to about an inch in diameter. A dark red color and dotted on the inside with many black dots. It also will not prove popular with the florist, but should be valuable in breeding experiments.

A recent acquisition to our garden is *A. pulchra*, variety *tricolor*, imported from Holland. It withstands our winters here if given sufficient protection to keep the tubers from freezing. It grows to a height of twelve to eighteen inches, and has two to four peduncles with one to two flowers on each. Each flower is white with a flush of light maroon taking away the starey white and giving to it a soft delicate cast. On the back of the sepals there is a broad band of lively maroon which extends from the base to the extreme tip ends, while the sepals are tipped on the inside with a patch of maroon. The two upper petals are white below the middle and pencilled with many little dots and dashes of light maroon, immediately above this a broad band of golden yellow runs across the petal, between this and the tip is a large spot of dark maroon with just a narrow white line setting off the pointed tip, the bottom has a few dashes of maroon on the tip just as if the two top petals could not carry it all and some dripped upon the lower one. A patch of these nodding in the breeze look like a bevy of butterflies basking in the sunshine and flapping their wings preparatory to flight. While this species was still new to me I was cultivating around them when I accidentally broke off one of the stems and imagine my surprise when I noticed a newly formed tuber adhering to it just below the ground level. Further examination showed this to be a common habit

of this species. I thought I had something here, but Herbert beat me to it by about a hundred years for he mentions the same characteristic in his description of it.

In a few places along the Pacific Coast from British Columbia to Southern California a yellow *Alstroemeria* has been grown for many years. It is the most common one in cultivation, and is *A. aurantiaca*, variety *lutea* (see Fig. 85.) Sometimes it is given specific rank as *A. lutea*. In the Bay region near San Francisco it is grown in commercial quantities for the florists' trade along the coast. It grows to a height of three to four feet and bears flowers of a clear butter cup yellow. The flowers are in umbels of three to five peduncles and usually two on each. They are about two inches across and open out quite widely. The leaves stay green while they are in bloom which adds much to their general appearance for florist's purposes.

The orange colored form is frequently seen—*A. aurantiaca*. Recently another form was imported under the name of *A. revoluta* which does not conform to Herbert's description or illustration but seems to be a beautiful orange red form of *A. aurantiaca*. These are of the easiest cultivation when once established and require very little attention and give an abundance of flowers for the garden and for cutting.

As one looks back through the literature on the alstroemerias one is struck with the fact that there has always existed a great deal of uncertainty in their taxonomy. Lemaire in his description of *A. chilensis* comments upon this point for he writes, "Few plants, in reality, thrive, to speak in terms of the horticulturist, as much as the *Alstroemerias* in their native country. The winds and insects carry adulteratingly the pollen from one to the pistil of the others and produce without end new hybrids, among which, even while singling out the family, it becomes difficult to point out the original types. Also, in the exceedingly great number of species described and figured by authors, or preserved in herbaria, one does not hesitate to recognize that many are but variations and should be referred back to such and such types. We have acquired the conviction by our own research that any botanist who would wish to look into the subject would soon come to our point of view. Now in order to furnish a few proofs, What specific differences will be established between *A. aurea* and *A. aurantiaca*? Could not both of these arise from *A. haemantha*, or vice-versa? *A. pallida* and *A. nellii* seem to have a close enough parentage. Can they cite *A. pulchella* as distinct? (he refers here to Sims confusing *A. haemantha* with *A. pulchella*). No one would know how to dispute the knowledge of our most distinguished horticulturist, M. Jacques, chief gardner for the Royal Domains at Neuilly, having a few years ago received some seeds of a species of *Alstroemeria* which a traveller had brought back to him from Chile, he planted them, and cultivated the plants with care, which prospered. What was his surprise, when on seeing them in flower for he counted eight very distinct varieties, in which he believed that he recognised, *A. aurantiaca*, *A. tricolor*, *A. Flos-Martini*, *A. pallida*, *A. neillii*, *A. haemantha*, *A. pulchella*, and *A. aurea*, etc."

The dilemma which faced Lemaire has not materially improved since his time in so far as it is possible to determine the true types, for just as he states "the winds and insects adulteratingly carry the pollen from one to the other" until now after almost one hundred years of cultivation in our gardens it is little wonder that we can detect characteristics of many species in one and their seedlings have a tendency to show segregation, which makes identification still more complicated.

Botanical authorities generally concede that the species *A. haemantha* and its varieties, *A. chilensis*, and others, is determined by the ciliation on the margins of the leaves. From my observations I am of the opinion that practically all the pink and pastel shades of the alstroemerias being grown today are but forms and varieties of *A. haemantha*. This species grows about three feet high, and has an umbel of three to four comparatively long peduncles with three flowers on each. The stems are decidedly reddish and the leaves are sparse and spirally twisted on the floriferous stem while they are longer and wider and more abundant on the shorter sterile stem. The cilia on the margins are about two mm. long and quite conspicuous. The flower is a beautiful cinnabar color, but it does not open as wide as some of the other varieties. While the flower is still in bud, the tips of the sepals recurve slightly and give it an urn-like shape, and the upper sepal is decidedly recurved when the flower is opened, this and the lower petal are very much abbreviated and the two upper petals are very acute. Ruiz and Pavon described the first *A. haemantha* and this species agrees very closely with their records, and the *A. ciliata* of Poeppig, which Herbert claims should be var. *pilosa* because of priority.

Poeppig who did a great deal of botanizing in Chile and Peru from 1827 to 1832 writes in his *Fragmentum Synopses Plantarum* that "there is preserved in our herbarium a very smooth variety which is lightly ciliated. The colors are very changeable, but they are outstanding alternately as a single individual or in groups or in a mass, burdened with flowers of cinnabar, brick-red, golden orange, golden yellow, lemon yellow, and white, however the two uppermost segments always marked with deep purple". Practically all these colors are seen in what we grow as *A. chilensis*, and they are just as Poeppig says "outstanding either singly or in mass", with all these colors blending into a perfect sea of color. *A. chilensis* grows about four to five feet high and carries from five to fifteen peduncles with three to five flowers on each. The flower is rather open, about two inches across and a little longer, and the same markings as given previously under *A. Ligtu*. Kunth writes that there are many forms grown in the Berlin Herbarium Gardens under the name of *A. chilensis*. Several variations are quite noticeable in a planting of these, but they are all characterized by very short cilia on the edges of the leaves.

Several plants in my collection received as *A. angustifolia* do not agree with the illustration or description of Herbert, and again they are ciliated, so I do not believe them to be the true type of *A. angustifolia*.

Mr. Orpet kindly sent me two tubers of a species to grow and identify, this I succeeded in doing and it proved to be *A. Hookeriana*. It is about two feet in height and has a very light pink flower about two and one quarter inches across and opened out perfectly flat. (See Fig. 70.) It fits perfectly the description in Bot. Cab. 1827. t. 1272. Some three or four years ago the University of California sponsored a botanical trip to the Andes of South America, and from reports they were successful in obtaining several species of both *Alstroemeria* and *Bomarea* not previously in cultivation. These they are propagating in their trial grounds, and we shall be awaiting with interest further reports. Mr. Brydon kindly furnished me with some seeds of a promising new species, *A. violacea*, but so far I have not been too successful with it under our Northern winter conditions.

The bomareas presented some interesting problems which had to be solved before their culture was assured. About a dozen species are thriving in my garden. They include the following species,—*Bomarea campaniflora*, *B. multiflora*, *B. caldasiana*, *B. sp.*, *B. costaricensis*, *B. Ovata*, *B. salsilla*, *B. Lehmanii*, *B. frondea*, *B. oligantha*, *B. sp.* Several of them have bloomed and the others are growing so splendidly that they surely will reward me soon with their golden bells. Dr. Killip of the U. S. National Herbarium is doing some excellent work on this little known Genus and I am sure the alstroemeridians will be looking forward to the consummation of his studies on *Bomarea*.

At this time and as this edition of the *Herbertia* goes to press, it is with the fullest realization that just a beginning has been made in study of this Family, Alstroemer's Lilies. There is still much literature to be looked into and much translating yet to be done. With me this is only an avocational pursuit, but future editions of *Herbertia* will include additional findings as they are made.

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THE IXIOLIRION TRIBE*

HAMILTON P. TRAUB

From the morphological standpoint, the Ixiolirion Tribe is the most primitive of Subfamily III, EUMARAYLLIDEAE. All members of the other tribes of this Subfamily—*Callicoreae*, *Haemantheae*, *Cyrtantheae*, *Amarylliseae*, *Zephyrantheae*, *Galanthaeae* and *Narcisseae*, have a leafless scape, and the flowers are borne in an umbel which is fully established as a general rule. In *Ixiolirion* and *Kolpakowskia*, the two genera of the Ixiolirion Tribe, however, the scape is more or less leafy and the umbellate flowering habit has not been completely fixed, and may be described as a near-umbel. These morphological characteristics at once set off this Tribe from the rest of the members of this Subfamily and entitle it to tribal rank.

[In connection with the problem of the umbellate inflorescence in the AMARYLLIDACEAE, it is worth while to point out that this is a very suitable subject for a doctorate thesis in plant science. Important genera showing transitional stage are *Hemerocallis*, *Agapanthus*, *Ixiolirion*, *Kolpakowskia*, and possibly others. Mr. L. S. Hannibal, who is studying the *Callicoreae*, has pointed out to the writer that he has observed the incomplete fixation of the umbellate flowering habit in *Callicore rosea*. At the other extreme of the evolutionary development we have the umbel with a few to a solitary flower as in the *Zephyrantheae*, and some species of *Cyrtanthus*, and *Narcissus*.]

On account of its distinct divergence in vegetative morphological characters from the more typical amaryllids, systematists have differed widely in their opinion as to the phylogenetic position of the Genus *Ixiolirion*. William Herbert (1837) placed it among strangers in the section *Ixiaeformes*, under his sub-order *Agaveae*. Ker (1817) and Griffith (1851) considered *Ixiolirion* synonymous with *Alstroemeria*, and this precedent probably influenced Bentham and Hooker (1883) and Baker (1888) who placed it with the *Alstroemerieae* where it clearly did not belong. Pax (1887) was the first to perceive the closer relationship of *Ixiolirion* to the typical amaryllids, and to accommodate it he founded the subtribe *Ixiolirinae*, changed to *Ixioliriinae* by Pax and Hoffman in 1930. These workers placed it however between the subtribes *Crininae* (=Tribe 6. *Callicoreae* in the present work) and *Eucharidinae* (=Tribe 13. *Eucharideae*, in part, in the present work), where it was undoubtedly out of place. Hutchinson (1934) followed Pax and Hoffman, but raised the subtribe *Ixioliriinae* to the rank of a tribe, *Ixiolirieae*. Traub (1938) on the basis of the external morphology, characterized this tribe as the most primitive of the amaryllids with inferior ovaries (=Subfamily III. EUMARAYLLIDEAE), and placed it at the beginning of the group. However, neither Hutchinson (1934) nor Traub (1938) gave any literature citations for the tribal name, *Ixiolirieae*. This deficiency is made good in the present Chapter.

* This is abridged from Chapter 11. The Ixiolirion Tribe (Tribe 5. **Ixiolirieae**) of the writer's unpublished manuscript monograph on the **Amaryllidaceae**. It is published at the request of members interested in this tribe.

Tribe 5. IXIOLIRIEAE (Pax) Hutchinson et Traub *comb. nov.*

Hutchinson, Fam. Fl. Pl. II. monocotyl., 1934, p. 134, without citations; Traub, HERBERTIA 5:112. 1938, without citations; *Ixiolirinae*, Pax, nat. pflanzenfam. II. 5 abt. 1887, pp. 109-110; *Ixioliriinae*, Pax & Hoffman, nat. pflanzenfam. 15a., 2 aufl. 1930, p. 410.

Type genus.—*Ixiolirion* (Fischer) Herbert.

Diagnosis.—Rootstock a bulb; scape leafy; flowers regular, inflorescence subumbellate; perigone without or with a tube; ovary, inferior, fruit a capsule, seeds numerous, oval-oblong, angled.

KEY TO THE GENERA OF TRIBE 5. IXIOLIRIEAE

- A. Perigone without a tube, stamens attached to the tepals for a short distance at the base (Asia Minor, to central Siberia and Baluchristan) ----- Genus 32. *Ixiolirion*
- AA. Perigone with a tube, stamens attached to the tube (Turkestan, and Karateginjugum) ----- Genus 33. *Kolpakowskia*

THE GENUS IXIOLIRION

The Genus *Ixiolirion* was founded by Herbert in 1821. The group is so distinct that its validity has been beyond question from the first. However, its phylogenetic position has been in doubt until recently. The species on which the Genus is based was originally described by Pallas as *Amaryllis tatarica* in 1776. Herbert originally recognized two species, *I. montanum*, and *I. tataricum*, and additional species were proposed by others as indicated in the literature citations below, but Regel (1879) showed conclusively that there was but one species involved.

Genus 32. IXIOLIRION (Fischer) Herbert

Herb. Append. pp. 37-38. Bot. Mag. 49. 1821; Herb. Amaryll. 1837, p. 125.

Diagnosis.—Rootstock a tunicated bulb; leaves linear, mostly aggregated at the base of the slender erect stem; inflorescence subumbellate; perigone regular, without a perigone tube, ovary inferior; segments free, equal to subequal; stamens, of two sets of lengths, shorter than the pistil and segments; filaments attached to the tepals; anthers basifixed; ovary clavate, 3-celled, ovules many, superposed; capsule loculicidally 3-valved; seeds small, oval-oblong, angled, black; one species; distribution—Asia Minor to central Siberia and Baluchristan.

DESCRIPTION OF SPECIES

1. IXIOLIRION TATARICUM, (Pallas) Herb., Herb. Append. Bot. Reg., p. 37, 1821; Herb. Amaryll. 1837, p. 125, t. 19, 20; Regel, desc. pl. fasc.

7, pp. 206-208; Regel, pl. semenov. n. 1037; Roem. et Schult. syst. VII., I., p. 752; Kunth. enum. V., 1850, p. 818; Regel, gartenfl. 1878, p. 264.

Syn.—*Amaryllis tatarica*, Pallas, reise russ. reichs, 1776, pp. 727, t. D. fig. 1; Georgi, beschr. d. r. reichs, III. 4, p. 890; Ledebour, fl. alt. II. p. 40; *Amaryllis montana*, Red. lil., p. 241; Labill., syr. dec. 2. p. 5. t. 1; *Ixiolirion montanum*, Herb. Append. Bot. Reg. 1821, p. 37; Herb., Amaryll. 1837, p. 125, t. 20; Herb., bot. reg. 1844, t. 66; Kunth., enum. V. p. 817, 1850; *Ixiolirion Pallasii*, Fisch. et Meyer, Ledb. fl. ross. IV. p. 116. 1853; Regel, gartenfl. 1873, t. 775, fig. 3, 4; Ledebour, fl. ross. 6: 116-117, 1853; Regel, gartenfl. 1877, p. 226, t. 910; *Ixiolirion Ledebouri*,

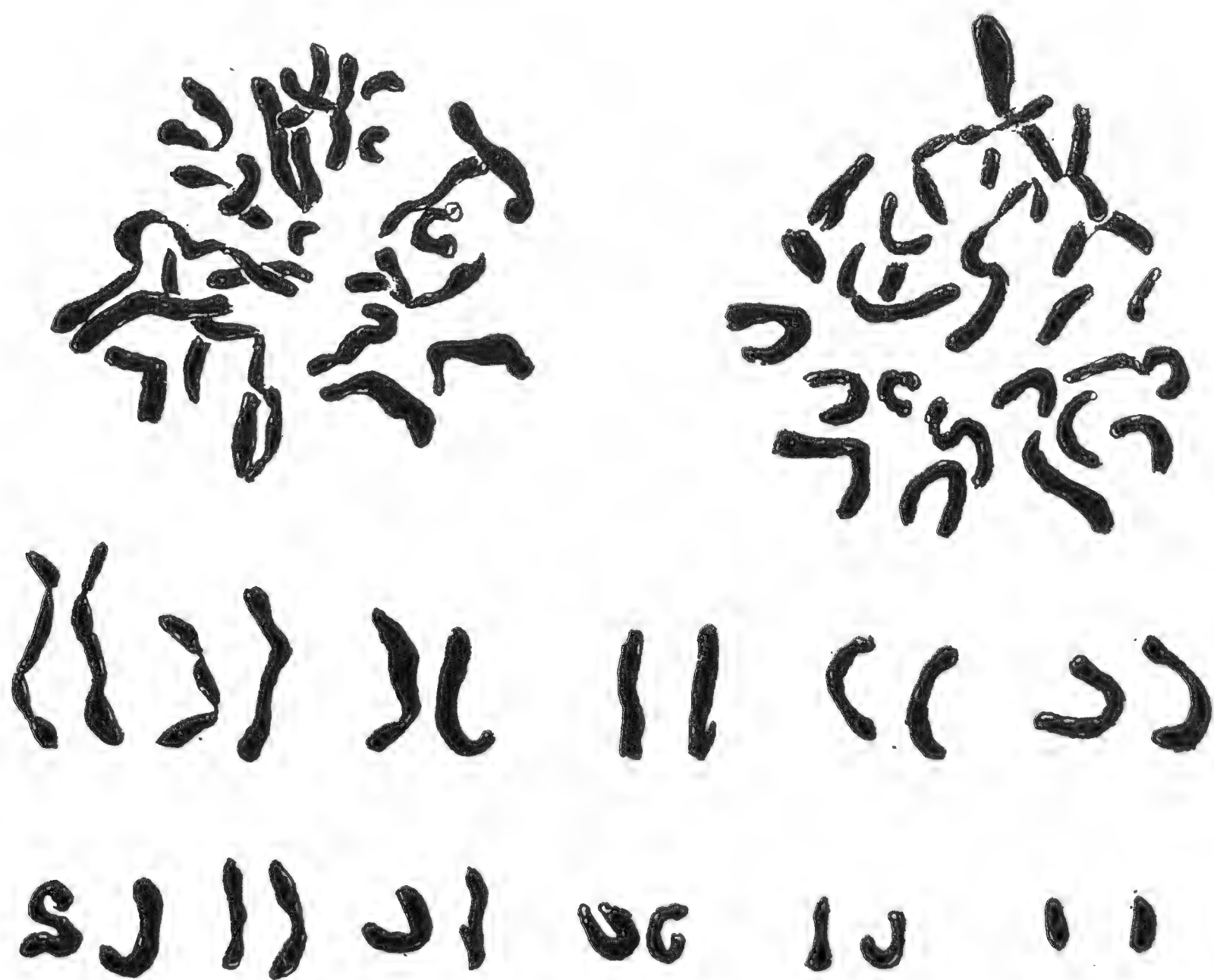


Figure 71. Camera lucida drawings of typical 2x chromosomes from root tips of *Ixiolirion tataricum* (Pallas) Herbert; upper, typical metaphase plates, left, received as *I. montanum*, right, received as *I. Pallasii*; lower, typical chromosome pairs arranged in order of size. All approximately 2800X.

Fisch. et Meyer, Ledb. fl. ross. 6:117. 1853; Fisch. et Meyer, Bong. et Meyer suppl. fl. alt. n. 293; Regel, gartenfl. 1878, p. 264; *Ixiolirion macranthum*, hort., Baker, amaryll. 1888, p. 132; *Alstroemeria montana*, Ker, jour. sci. & arts 2:370-371. 1817; *Alstroemeria triflora*, Griffith, Ic. t. 273; nota pl. asiat. III. pp. 240-241. 1851.

Chromosomes.—The comprehensive review of the literature on chromosome numbers in the AMARYLLIDACEAE by Flory and Yarnell in 1937 (Herbertia, vol. 4, 1937, pp. 163-181.) revealed that no chromosome counts had apparently been recorded for *Ixiolirion* species. The follow-

ing preliminary results were secured by the writer in 1941.* Bulbs of *Ixiolirion tataricum* were secured from two American dealers under two different names. One lot was labeled *I. montanum* and the other *I. Pallasii*. As pointed out elsewhere, these two names are synonyms of the first.

The actively growing root tips were killed and fixed for six hours in a modification of Belling's and Randolph's formulae of Navashin's solution; were then washed three times in 50 per cent ethanol and stored in 70 per cent ethanol. The material was dehydrated in ethanol, cleared in cedar oil (1/3, 2/3 and pure); embedded in paraffin at 54 degrees Centigrade. The sectioned material (cut to 20 microns in cross section) was transferred to slides and after removal of paraffin, was stained by the usual procedure with Crystal Violet-Iodine-Picric, and mounted in balsam. The prepared slides were studied under the high power compound microscope.

Camera lucida drawings of typical metaphase plates, shown in Fig. 71, indicate that the two lots of bulbs are of the same species. The results show that the somatic or 2x chromosome number of *Ixiolirion tataricum* (Pallas) Herbert is 24, the size of the chromosomes varying from short to relatively very long. Since *Ixiolirion tataricum* is the most primitive member of Subfamily III. EUAMARYLLIDAE, the basic or x chromosome number of this Subfamily may be considered as 12. This haploid number is in itself not proof of primitiveness, but if taken together with the leafy scape, the incomplete fixation of the umbellate flowering habit, we may be quite certain that we are dealing with the most primitive member of this group.

Description.—The descriptions of *Ixiolirion tataricum* in the literature as a rule are lacking in important particulars, and some statements made are incorrect. Baker (1888) for instance claims that the bulb is "necked." The following description is based on the study of several hundred plants grown in Maryland. It will explain how such errors came about. This description contains details that are usually frowned on by one school of "herbarium" botanists, but such details are vitally needed in progressive systematics.

SIBERIAN LILY, TARTAR LILY. Bulb ovoid, up to 2.5 cm. diam., without a neck, dormant during summer and early fall; stem produced to soil surface in late fall or early winter, bearing from 3 to 8 long linear ascending leaves aggregated in a tuft that persists through the winter; scape produced in spring, arising from center of tuft of leaves; scape 25 to 40 cm. tall, bearing up to 3 smaller leaves; spathe-valves 2 to 3, green or membranous, bractioles usually on single pedicels, and sometimes on branched pedicels within the umbel, branches subtended by a single bract below the pedicel; rudimentary flowers, blue in color, in the nature of short, single relict tepals, and subtended by bractioles appear occasionally on the pedicels below the flowers; pedicels

* The work here reported was carried out in the cytological laboratory of Dr. Delmar C. Cooper, while the writer was on leave of absence at the University of Wisconsin in 1941. This opportunity is taken to acknowledge with thanks the encouragement and inspiration received from Dr. Delmar C. Cooper, and Dr. R. A. Brink of the Genetics Dept.; Dr. A. E. Allen and Dr. R. C. Bryan, of the Botany Dept.

unequal in length; flowers from 2 to 8 in the umbel, and usually 1 to 2 below it, light blue to dark blue in color; 3 to 4 cm. long, tepals free, oblanceolate, acute, with 3 to 5 distinct ribs; filaments filiform, attached to base of tepals, anthers basifixed; when flower first expands 3 stamens are much longer than the other 3 and the pistil, but when flower is mature, the pistil is almost as long as the longer stamens which are much shorter than the tepals; stigma trifid; ovary inferior, clavate, 3-celled, ovules many, superposed; capsule loculicidally 3-valved; seeds small, oval-oblong, angled, with black testa. Soon after the seeds ripen in late spring the stem dies and the bulbs remain dormant until late fall or early winter.

Habitat.—Asia Minor, to central Siberia and Baluchistan.

Notes.—Discovered by P. S. Pallas between 1772 and 1773, and described by him as *Amaryllis tatarica* in 1776. The foremost authority on *Ixiolirion*, the late Dr. E. Regel, examined many specimens of the various forms of this species that had been proposed as separate species, including the specimens in the Semenov herbarium. He felt that the contrasts between straight and curved, long and short anthers, more open and more closely placed tepals, are not sufficiently important to be used as the basis of specific distinctions. Besides the type, he recognized four forms,—*intermedium*, *Ledebouri*, *crispum*, and *brachyanderum*. He found however that there were intermediate forms between them. It is for this reason that the forms are not recognized in the present work. Baker, in 1888, refers to the work of Regel, but unfortunately he neglected to make use of Regel's researches who showed that the correct name for the species is as now recognized. Baker chose the name *I. montanum* Herb., but gave no reason for doing so.

Ixiolirion macranthum Hort., apparently known only from the brief reference made to it by Baker (Amaryll. 1888, p. 132) is described as a form with an unusually large flower. Baker does not cite the original description, unless his brief note is to be considered as such. Anyone having further information about this form should publish the facts in HERBERTIA since there is now keen interest in this species.

In Maryland, this species begins to bloom toward the end of April, and the last flowers fade late in May.

The bulbs of *Ixiolirion tataricum* are entirely hardy in the North, and should also give good results in the Middle South as tests in Maryland have shown. In central Florida the results were negative. Bulbs should be planted in the fall; the writer planted his from 3 to 4 inches deep. For forcing indoors cold treatment will be needed. Bulbs stored for two months in a refrigerator at 36 to 40 degrees Fahrenheit and then potted, flowered normally whereas the controls not so treated either made flower scapes that did not emerge from the neck of the bulb when the abortive flowers opened, or did not flower at all.

In Europe, *Ixiolirion tataricum* has been cultivated to some extent but in America this plant has been mostly neglected until a few years ago when Wayside Gardens and Rex D. Pearce offered considerable numbers of bulbs to the retail trade. More recently, the Oregon Bulb Farms, a wholesale concern, has offered thousands of bulbs to retail

dealers. Such quantity production is encouraging and will insure a steady supply of this beautiful subject to the American gardener.

Recently Baranov and Poddubnaja (Bull. Univ. de Asie Cent. Tachkent, No. 11, pp. 1-14. 1925) have reported on the embryology of *Ixiolirion tataricum*. According to these authorities the archesporial mother cell by two successive divisions forms four macrospores. The three upper disintegrate while the lower one gives rise to the embryo-sac which is of the type with eight nuclei.

THE GENUS KOLPAKOWSKIA

This Genus dates from 1878, when it was described by Regel on the basis of *Kolpakowskia ixioliriodes*, but he erased it the following year and proposed it as a synonym of *Ixiolirion*. Baker (1888) followed Regel. However in *Ixiolirion* the perianth segments are free but in *Kolpakowskia* they are united into a tube for part of their length at the base. On the basis of this evolutionary change the Genus *Kolpakowskia* is retained in the present work.

In 1901, Lipsky described *Ixiolirion karateginum*, a species also characterized by the presence of a perigone tube. It therefore must be placed with the Genus *Kolpakowskia*.

Both of these species are apparently unknown in America.

Genus 33. KOLPAKOWSKIA Regel

Regel, acta h. petrop. 5:634. 1878; Gartenflora 1878: 294-296, t. 953.; *Ixiolirion*, desc. pl. fasc. 7, pp. 206-208. 1879; Baker, Amaryll. 1888, p. 133.

Type species.—*Kolpakowskia ixiolirioides* Regel.

Description.—Chromosomes undetermined; rootstock a bulb, leaves mostly aggregate in a basal tuft, and one or more above it on the stem; inflorescence sub-umbellate, flowers 2-7, perigone tubular for part of its length at the base; ovary inferior, stamens attached to tube for part of their length at base; two species.

KEY TO THE SPECIES OF THE GENUS KOLPAKOWSKIA

- A. Filaments similar in form (Karateginjugum) -----1. *Kolpakowskia karateginum*
- AA. Filaments not similar in form, 3 filiform, 3 broader. (Turkestan) ----2. *Kolpakowskia ixiolirioides*

DESCRIPTION OF SPECIES

1. KOLPAKOWSKIA KARATEGINUM (Lipsky) Traub *Comb. nov.*; *Ixiolirion karateginum*, Lipsky, acta horti petropol. 18:108-110. 1901.

Description.—BOKHARA LILY. Plant 5 cm. to 15 cm. or almost 30 cm. high; bulb ovate to oblong-ovate, tunics gray-brown; stem mostly with greater part sunk in humus, the free part straight, much exceeded by the leaves; leaves 3 or 4, linear, plicate, long-attenuate toward apex;

flowers 2-7, small, to very small, pale lilac or almost white, subumbellate, subtended by scarious-margined spathe valves; perigone rotate, tube short, segments spreading, 4 times longer than tube, the inner segments obovate, the outer linear-elliptic, all green-mucronate-apiculate at apex and attenuate at base, forming a tube; ovary inferior, anthers subglobose or a little longer than wide, sulfur-yellow, the filaments white.

Habitat.—Central Asia; Bucharra, Prov. Karateginjugum.

Notes.—Lipsky states that in “habit, method of growth and flower color near to *I. Kolpakowskianum*, Regel, but differing however in much smaller flowers, in the proportions of the perigone, the segments broader and of different shape, the tube proportionately shorter, the anthers punctiform, the filaments conform, not unequal.” He observes that “At first view it suggests *Scilla*.”

2. *KOLPAKOWSKIA IXIOLIRIODES* Regel, acta h. petrop. V. p. 634, 18; Regel, gartenfl. 1878, pp. 294-296, t. 953. *Ixiolirion Kolpakowskianum*, Regel, descr. pl. fasc. 7. p. 208, 1879; Baker, amaryll. 1888, p. 133.

Description.—TURKESTAN LILY. Bulb 1.3 cm. diam., producing bulblets on short stolons; leaves ascending, about 4 aggregated in a basal tuft and 1 and 2 smaller ones above it; flowers 2 to 4, generally all in the terminal near-umbel; perigone tubular for part of its length; tepal-segments, whitish-violet, 2 to 2.5 cm. long, very narrow; ovary inferior, stamens attached to tube, 3 filaments filiform, 3 broader.

Habitat.—Turkestan; alt. 900 to 1800 m.; sandy hills.

Notes.—Discovered by Dr. Albert Regel in 1878. According to the late Dr. E. Regel, it over-wintered without protection in the open in his nursery, and bloomed during the last third of May.

NOTES ON ZEPHYRANTHES BIFOLIA FROM ITS NATIVE COUNTRY

GEORGE H. HAMOR, *Barahona, Dominican Republic*

A little over four years ago, while taking an automobile ride over a rough, hilly, back country road here in the Dominican Republic, my wife and I located a colony of *Zephyranthes bifolia* in one of its native habitats. Way back in the bush and miles from human habitation, we were astonished to see a pink *Zephyranthes* which at first we thought to be a specimen of *Z. grandiflora*. No great attention was paid at the time, but later investigation proved that the plant was *Z. bifolia*, and various trips back for observing and collecting disclosed the fact that a considerable colony existed at that place.

This species is unquestionably one of the most beautiful of the genus and merits much attention for its ornamental value alone. However, it also is of unusual interest because of certain varying characteristics of which, so far, I have seen no mention in any publication. Neither have I seen any mention of its simple cultural requirements, for lack of which knowledge I believe efforts to grow it in the U. S. A. have failed. The species is native to the island of Santo Domingo and doubtless the progenitors of the plants in the Brace garden of the Bahamas were taken there from this country or from Haiti in the western end.

Neither of the specific names applied, *bifolia* or *cardinalis*, is properly descriptive as it is very polymorphic, especially in the flowering characteristics of different plants.

The particular habitat where the colony was discovered lies in Barahona province in the southwestern part of the Dominican Republic, at 1200 ft. above sea level; in conditions of light shade, well drained soil of decomposed shale and considerable limestone, with little organic matter; climate subtropical with intermittent rains from May to November, the other months very dry. Several hundred plants and several dozen flowers have been observed in this locale and from there we have brought about four hundred plants to the garden. As a result the general habits, characteristics and requirements of the species are well understood at least in so far as they are related to the conditions under which we have made observations.

Z. bifolia is distinctly a dry land species and during the long rainless periods the foliage dies down completely on many plants. Under garden conditions where water is available for sprinkling they can be kept evergreen but are better contented if given a vacation from growing. Of their various habitats in the Island some writer remarked "Of wide distribution but apparently much localized," and I believe this opinion to be correct for with the exception of the plants in the colony mentioned no others have been located though a fairly diligent search has been made over a rather large area in the vicinity.

Where these plants were found all propagation is by seeds. In no instance has a clump of bulbs been observed. Due, no doubt, to rather poor soil and long dry periods, growth is apparently slow and the percentage of small plants is relatively high. Many of these young plants

bear only two leaves and it must have been from observation of similar growth elsewhere that the name "bifolia" came to be applied. Also it is evident that flowers of the red type only were used as specimens for description.

For the purpose of disseminating information about the species, I am giving its unusual morphological features as they have been observed and noted from time to time; such notes having been based on observations made both in the wild and in the garden. Also I am describing its cultural requirements.

Leaves 6-8, sometimes more, 15-25 cm. long, 6-8 and occasionally 10 mm. wide; flowers from $1\frac{3}{4}$ to $4\frac{1}{2}$ " diameter; color from light to rose-pink to deep cardinal red, position from very nearly upright to definitely declined; scapes from 3 in. to 13 in. long. Many of our garden plants have numbered stakes set alongside for the purpose of

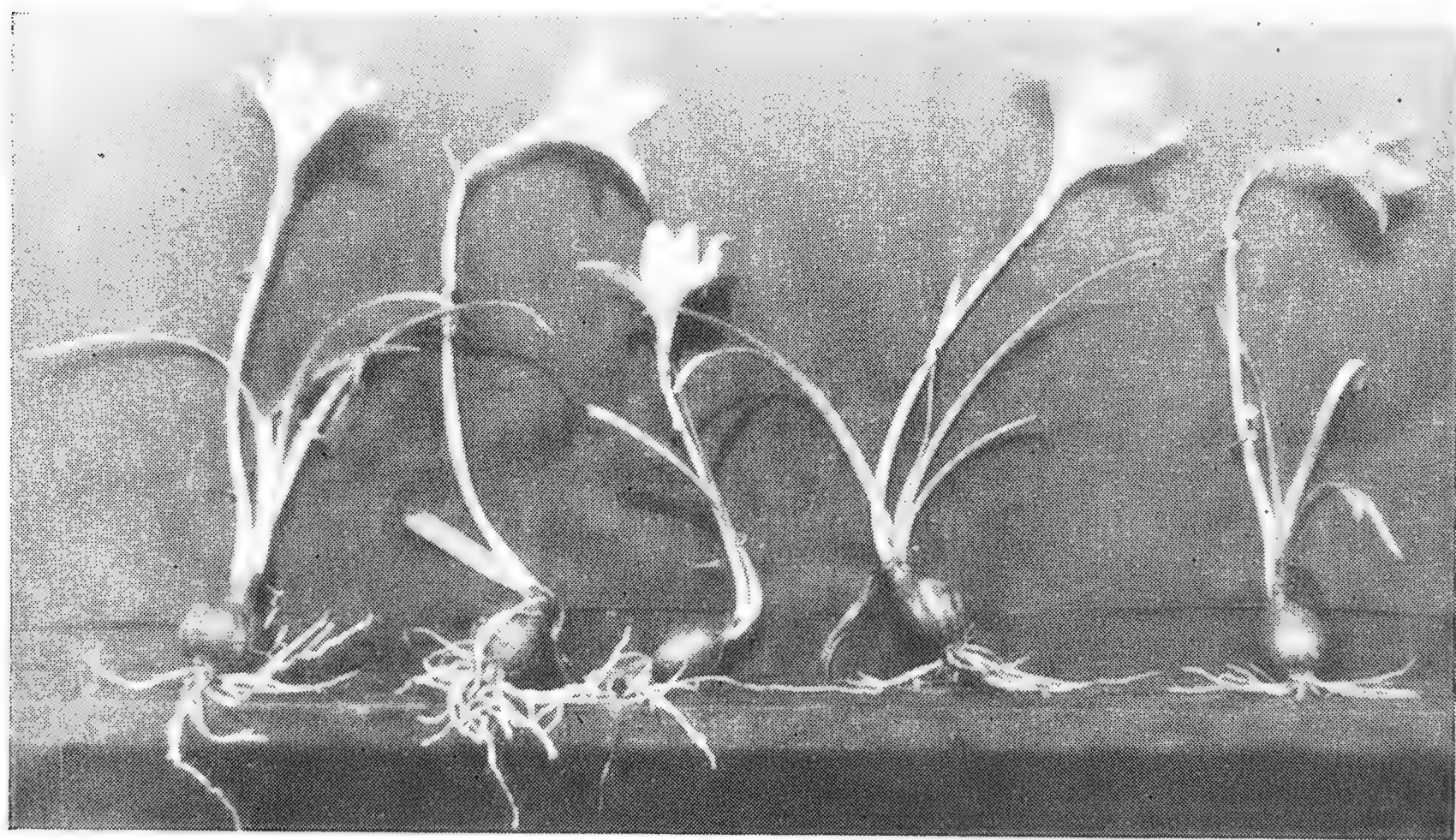


Fig. 72. *Zephyranthes bifolia*
Photo by G. H. Hamor, Dominican Republic

keeping individual records, and the notes taken indicate clearly that any particular plant maintains its own special characteristics through any number of flowering periods. The following data, taken from the record book, show sufficiently well the varied characteristics of the species as shown in twelve different plants: 1.—Very light pink; scape 3"; 2.—Very dark pink; scape 12"; 3.—Medium pink; scape 8"; 4.—Red, $1\frac{3}{4}$ " diam., acute apex, scape 12"; 5.—Red, free flowering, 6 flowers during May and June, 1941; scape 13"; 7.—Salmon red, 4", segments broad, not acute; scape 4"; 11.—Red, $4\frac{1}{4}$ ", segments broad; scape 8"; very handsome; 13.—Pink, $1\frac{3}{4}$ "; scape 5"; poor; 17.—Very light pink, $2\frac{3}{4}$ "; scape 5"; 20.—Light red, 4"; scape 10"; very handsome; 22.—Light red, $4\frac{1}{4}$ "; scape 6"; very handsome; and 23.—Rose Pink, rather vivid, $4\frac{1}{2}$ " scape 6".

Any variation from the measurements given for different flowers produced by the same plant is very small, in other words, for any given plant these characteristics are very much fixed. In all the flowers, but particularly noticeable in the pink shades, there exists an effect as of a minutely grained, glistening, silvery powder, sprinkled over the upper surface of the segments, a feature which I have not observed in any other species known to me.

In view of the fact that no color other than red has been reported heretofore, an assumption may arise to the effect that this colony of plants had its origin in some hybrid flower, but such a theory would seem untenable. The locale is a very long distance from the habitations of people who might take an interest in ornamental plants, and the one other species indigenous in Santo Domingo and Haiti—*Z. Plumieri*—is a plant of acid soils which are non-existent in this part of the country. Moreover, the morphological characteristics of the spathe, stipe, stamens and pistil, conform perfectly with the description of these parts given by Dr. H. Harold Hume for *Z. bifolia* in the 1939 issue of "Herbertia."

Under garden conditions the plants increase both by seeds and by bulb offsets, but in this respect too they are very variable. Some of our plants have never matured seeds; No. 5 for instance has produced many flowers but has matured no seed capsules even with hand pollination. I do not claim definitely that the plant cannot be hand pollinated; I say only that I have been unable to do it. Other plants mature seeds from every flower if permitted to do so. The increase by bulb offsets is very slow compared to the rate of other species. In one of our garden plots which has over one hundred plants brought in and set there more than two years ago, there are some which still have only the original bulb, while others have made considerable increase. Plant No. 5, mentioned above as producing no seeds, has now increased to four bulbs of flowering size. Another plant recently had five flowers open at once, indicating the presence of not less than that number of flowering sized bulbs.

As to cultural requirements: these plants, taken from their habitat in light shade at 1200 ft. elevation, have performed in a very satisfactory fashion in full sunlight here, just a few feet above sea level. They appreciate a mulch to keep the ground cooler and to conserve moisture, but will get along well enough without it. Like other plants, their growth and general vigor are better in good soils, but they will survive and flower in those of poor quality. Noting these traits, it is evident that the species possesses a very considerable degree of adaptability. There is one condition however which should not be overlooked by anyone desiring to grow the plants well; *they are definitely natives of alkaline lands and under cultivation should be limed liberally*. If provided with a rather light, friable, fairly rich, well-drained, well limed soil, in my opinion there is no reason why the amateur as well as the skilled gardener cannot grow them successfully.

In view of the unusual beauty of the flowers of *Z. bifolia* and the great variation in color types, size, etc., I believe that the species offers greater possibilities than any other for highly interesting development through selection and crossing.

A REVIEW OF THE SPECIES OF CRINUM

J. C. TH. UPHOF, *Washington, D. C.*

One of the largest genera of the Amaryllidaceae is *Crinum*. Baker in his revision of *Crinum* in 1888, recognized 79 species, but since that date no less than 61 additional species have been described, often on very flimsy type material. In order to bring all of this new material under one roof, I wish to present a review of the species of *Crinum*, including brief historical data, followed by the detailed descriptions of the species. No attempt has been made to go into the matter critically at this time as would be required if a monograph were presented. No attempt has been made to reduce species to synonyms, to make new combinations, or to propose new species.

I.

The name *Crinum* was given by Linnaeus and it is clearly established in his *Genera Plantarum*¹. It is a name which the great Swedish botanist used to replace the compound word *Lilio-Asphodeli* as understood by Dillenius². The word *Crinum* is derived from the Greek meaning lily. Linnaeus mentions this name in his *Critica Botanica*³ under: “*Nomina Generica patrum botanices, Graeca vel Latina, si bona sint retineri debent, ut etiam usitassima & officinalia,*” and goes further on to state, “*a Graeca: quae apud Dioscoridem, & alios Graecos, praefertum The ophrastum (Th.) obvia sunt.*” There under a long list of names of various genera, we find alphabetically also the name of *Crinum*. In his *Philosophica Botanica*⁴ very little is said about this genus. Of far more importance is Linnaeus’ *Species Plantarum*⁵ where we find in his first two editions the names of *C. latifolium*, *C. asiaticum*, *C. americanum* and *C. africanum*, names that are still in use except the last one.

Crinum latifolium is mentioned first and is therefore the type with which all of the other species are to be compared. Among the older writers Rheede van Drakenstein⁶ may be mentioned. In his beautiful work he describes this species as *sjovanna-pola-tali* and illustrated it in plate 39. Linnaeus described the plant as “*Crinum foliis ovato-lanceolatis acuminatis sessilibus planis.*”

The second species is *C. asiaticum* and was first mentioned by Linnaeus⁷ in *Flora Zeylanica* as “*Crinum foliis carinatis,*” and which in earlier days was described by Hermannus⁸ as “*Lilium zeylanicum bulbiferum & umbelliferum.*” Rumphius in his famous folio work⁹ has used the name *Radix toxicaria* for this species.

¹ Linnaeus, Carolus. *Genera Plantarum*. 97 Lugduni Batavorum 1737.

² Dillenius J. J. *Hortus Elthamensis*. 161 Londini 1732.

³ Linnaeus, Carolus. *Critica Botanica*. 103 Lugduni Batavorum 1737.

⁴ Linnaeus, Carolus. *Philosophica Botanica*. 155 Stockhomiae 1751.

⁵ Linnaeus, Carolus. *Species Plantarum* Tom. 1, Ed. I Holmiae 1753. Ed. II Homiae 1762.

⁶ Rheede van Draakenstein, Henricus. *Hortus Malabaricus*. Tom. XI:77 Pl. 39. Amstelodami 1690.

⁷ Linnaeus, Carolus. *Flora Zeylanica* 127 Holmiae. 1747.

⁸ Hermannus, Paulus. *Horti Academici Lugduno Batavo*. 686 Pl. 683. Lugduni Batavorum 1687.

⁹ Rumphius, Georgius. *Herbarium Amboinense*. Tom. 1:155. Pl. 69. Amsterdam 1740.

Considering the early nomenclature of *C. americanum* we find that Linnaeus had already described this species in his *Hortus Cliffortianus*¹⁰ as “*Crinum corollarum apicibus introrsum ungviculatis.*” Several years previously we find a description and beautiful illustration of this plant by Commelin¹¹. He gives this American plant the name of *Lilio-Asphodelus americanus sempervirens maximus polyanthus albus*. Another early known *Crinum* species that should not be overlooked is *C. zeylanicum* L. Linnaeus first named it *Amaryllis zeylanica* in his *Species Plantarum*, Ed. I 421 (1753) but was later renamed by him *C. zeylanicum* in his *Systema Vegetabilis* 263. An excellent illustration of this plant has been given by Commelin¹², who calls it *Lilio-Narcissus ceylanicus lati-folius, flore niveo, extreme linea purpurea striato*. Like all of his descriptions of plants, they are partly given in Latin as well as in Dutch. He mentions that the root (he probably means bulb) of this plant was sent in 1685 from Ceylon under the name of “Tolabo.” He states, among other details, that the fruits are three sided, although its seeds never came to full development. The plant had flowered several years in the Botanical Garden of Amsterdam during June. Rumphius called the plant apparently *Tulipa javanica*¹³.

The name *Lilio-Asphodeli* as understood by Dillenius and which Linnaeus superceded with *Crinum*, must have made some confusion among earlier writers. However, it will not be necessary to go into this in great detail. It is worth mentioning that Boerhaave¹⁴ describes two species of *Lilio-Asphodelus*—*luteus* and *puniceus*. He gives no illustrations, but it is clear from his descriptions that he has no *Crinum* in mind as we understand the genus at the present. Moreover, he refers to different authors, among whom is Clusius.¹⁵ In his work we find excellent descriptions and illustrations in wood-cuts of *Liliasphodelus luteo flore* which is clearly a *Hemerocallis*. Also Tournefort¹⁶ includes under this group a number of plants that have been transferred to entirely different genera.

Herbert¹⁷, who figured so largely in the description of the *Amaryllidaceae*, redescribed the various known species of *Crinum* and these were adapted with but little change from Roemer's Monograph and from Kunth's *Enumeratio*¹⁸. Another important contributor to this subject at the beginning of last Century was Roxburgh in his excellent *Flora Indica*¹⁹.

Herbert²⁰ places the genus *Crinum* L. between *Ammocharis* Herb. and *Callicore*, Link. (syn. *Amaryllis* Herb. non Linn.). These are

¹⁰ Linnaeus, Carolus. *Hortus Cliffortianus* 127 Amsterdam 1737.

¹¹ Commelin, J. *Plantae Rariorus* 14 Pl. 14 Amsterdam 1706.

¹² Commelin, J. *Horti Medici Amstelodamensis Rariorum*. Tom. 1:73 Pl. 73 Amstelodami 1697.

¹³ Rumphius Georgius. *Herbarium Amboinense* Tom. V:30 Pl. 105 Amsterdam 1740.

¹⁴ Boerhaave, Hermanus. *Intex Alter Plantarum quae in Horto Academico Lugduni Batavo*. Tom. II:110. Lugduni Batavorum 1720.

¹⁵ Clusius, Caroli. *Rariorum Plantarum Historia*. Liber II:137, Antwerpiae 1601.

¹⁶ Tournefort, J. P. *Institutiones Rei Herbariae*. Tom. I:344 Tom. II: pl. 179. Parisiis 1700.

¹⁷ Herbert, William. *Amaryllidaceae*, 1837.

¹⁸ Kunth, C. S. *Enumeratio Plantarum*. 1833.

¹⁹ Roxburgh, W. *Flora Indica*. 1832.

²⁰ Herbert, William. *Amaryllidaceae*. London, 1837.

placed with 12 other genera under the *Amaryllidiformes* of Suborder 4. *Amaryllideae*, under the "Third Division—Scapaceous." This "Division" comprises those plants with a succulent scape, spathaceous, not articulate below the spathe and it forms with two other divisions, namely the *Ramosae* and the *Caulescentes*, the family of the *Amaryllidaceae*.

He describes the genus *Crinum* as—"Germen thickest in the middle; tube cylindrical, slender; filaments inserted just outside the tube, more or less recurved; anthers incumbent, versatile; stigma 3-cornered or trifid; capsule soft, deformed, without valves or furrows; dissepiments obsolete. Seeds very irregular in form, size, and number. Leaves properly tubular at the base." He divides the genus into two subgenera, namely *Patentes* and *Semipatentes*. Up to that time 46 species were known to exist.

Herbert gives the first comprehensive account of hybrid crinums ("hybrid or mixed crosses"). In his *Amaryllidaceae* (1837) he includes twenty-three different names.

It appears that previous to the year 1880, the interest in the genus *Crinum* had diminished considerably. We note a statement by Baker—"During the last few years an interest in the genus *Crinum* which has pretty much slumbered for a whole generation, has revived, and a considerable number of new species have been discovered, and some of the old ones that were lost from cultivation, such as *C. purpurascens* and *C. Forbesianum* have been introduced afresh." There was no important advance in the study of this genus until Baker²¹ in the *Gardners Chronicle* proposed the division of *Crinum* into three subgenera, under the following names and diagnosis:

I. *Stenaster*, with *C. asiaticum* L. as the central type. The species of this group bear flowers that are relatively erect, having the linear segments of the limb either spreading or reflexing, which are not more than $\frac{1}{4}$ to $\frac{1}{3}$ inch wide. The filaments are suberect, diverging, as he states, equilaterally on all sides from the ascending style.

II. *Platyaster*, with *C. americanum* L. as the principal species, is composed of species with the following characters: perianth tube either straight or slightly curved; lanceolate segments of the limb spreading or ascending when entirely expanded; filaments equilaterally divergent from the suberect style.

III. *Codonocrinum*, centering around *C. latifolium*. It contains species with perianth tube more or less curved from the beginning to end of anthesis; limb horizontal or sub-erect; the oblong segments standing forward so that they are permanently connivent or imbricated in the lower half; filaments declinate, close together and nearly parallel with one another, and style declinate.

Baker's fundamental principles of classification of this genus are still followed by botanists, including Pax and Hoffmann, the authors of the *Amaryllidaceae*, in *Die Natürlichen Pflanzenfamilien*²². In this modern work of systematic botany, *Crinum* has been placed in the sub-

²¹ Baker, J. G. A Synopsis of the known species of *Crinum*. *Gardners Chronicle* 15:763, 1881.

²² Pax, F. und K. Hoffmann. *Amaryllidaceae* in Engler und Prantl. *Die Natürlichen Pflanzenfamilien*. Bd. 15 a :409. Leipzig. 1930.

family *Amaryllidoideae*, tribus I, 1 *Amaryllideae*, and Subtribus I *Crininae*. We find that the first genus is *Chlidanthus* Herb., and this is followed by *Crinum* L., *Ammocharis* Herb., *Cyrthanthus* Ait., and *Stenolirion* Bak.

Interesting and important is a study by Otto Staph about *Crinodonna Corsii* in Curtis Botanical Magazine, Tab. 9162. It is a garden hybrid between *Callicore rosea* (pistillate parent) and *Crinum Moorei* (staminate parent). This hybrid was first described by Attilio Ragioneri. According to Stapf it is not surprising that a cross between

TABLE I

Distribution of *Crinum* species throughout the World. (after Koshimiza)*

Locality *	Littoreal species	Island species	Marsh or stream-side species	Total number of species	Species per cent
Tropical Africa	59	7	—	66	40.244
South Africa	23	3	2	28	17.073
India	15	4	1	20	12.195
South America	13	1	2	16	9.756
Australia	13	—	—	13	7.926
Indian Ocean	8	1	1	10	6.097
Coast of Red Sea	10	—	—	10	6.097
New Guinea & Isles	7	—	—	7	4.268
Philippine Islands	6	—	—	6	3.658
Madagascar	3	3	—	6	3.658
Malay-Peninsula	3	—	2	5	3.048
China	5	—	—	5	3.048
Jamaica	3	1	1	5	3.048
Borneo	2	—	2	4	2.439
Burmah	4	—	—	4	2.439
Mexico & Central America	3	—	1	4	2.439
Cochin-China	2	1	—	3	1.829
Sumatra	3	—	—	3	1.829
Hawaiian Islands	2	1	—	3	1.829
Himalaya Mts.	—	2	—	2	1.219
Japan	1	—	—	1	0.609
Ogasawara Is.	1	—	—	1	0.609
Formosa	1	—	—	1	0.609
Java	1	—	—	1	0.609
Norfolk Is.	1	—	—	1	0.609
West Indies	1	—	—	1	0.609

* *Crinum americanum*, Linn., native to southeastern United States of America, was apparently overlooked by Koshimiza.

Callicore rosea Link. (syn. *Amaryllis belladonna* Herb. non Linn.) and *Crinum Moorei* is successful, since the relationship between the two parents is very close, although they are grouped under different genera. He further goes on to say that morphologically the first is merely a *Codocrinum*, "with a perigon whose congenital basal growth is arrested at a very early stage and with a leaf-bearing axis of extreme shortness, whilst physiologically it is characterized by the well known seasonal duration of its foliage." According to him the Cape Belladonna Lily

was differentiated, due partly to climatic factors, from ancestors of the *Codocrinum* group.

According to Koshimizu²³ the ancestor of *Crinum* must have been an inland plant from tropical Africa where it grew on sandy soil. From this type originated different forms and species, adapted to various localities. Through the aid of ocean currents the seeds were distributed over considerable distances, the plants thriving especially in tropical and in subtropical regions. Koshimizu supposes that *Crinum* was brought to Japan in recent geological times after the Glacial Period. He found that *Crinum asiaticum* L. var. *japonicum* Baker was spread over sandy shores in Japan by the "Warm Pacific Black Current."

The same author states²⁴ in a more recent paper that the number of *Crinum* species is 164. Of these 16 are inland plants, 7 are marsh or stream-side species, whereas the rest are all littoral. About 57 per cent are native to Africa. It is assumed that this Continent is the birth place of *Crinum*. Koshimiza gives us an interesting table of the distribution of *Crinum* species through the world as shown in Table I.

That *Crinum* species may be easily distributed by water can be readily understood from the bulbiform seed endosperm which contains a considerable amount of air and is protected by a thick corky layer²⁵.

In 1939 appeared the important paper by Milne-Redhead and Schweickerdt (Jour. Linn. Soc. LII:159-196, pl. 2, 3, 4, 1939) which has cleared up some matters concerning *Crinum* and *Ammocharis*. These workers show that *Crinum* species parading under the name *Crinum longifolium*, Herb. Amaryll. 271, becomes *Crinum bulbispermum* (Burm.) Milne-Redhead & Schweickerdt. *Crinum Tinneanum*, Kot. & Peyrit., *C. heterostylum*, Bullock, *C. angolense*, Benth., and *C. Baumii*, Harms, are transferred to the genus *Ammocharis*. *Crinum Bainesii*, Baker, *C. Thruppii*, Baker, *C. Lastii*, Baker, *C. rhodanthum*, Baker, and *C. ammocharoides*, Baker, are reduced to synonyms of *Ammocharis Tinneana*. *C. curvifolium*, Baker, becomes a synonym of *Ammocharis angolensis* and *C. coccineum* (Pax) Fritsch (Bull. Herb. Herb. Boiss. ser. 2, p. 1108, 1901), of *Ammocharis coranica*. These workers further point out that *Crinum nerinoides*, Baker, and *C. ondongense*, Baker, probably belong with *Ammocharis*, but this is left for further study.

In 1940, Hayward (Herbertia 7:92, 94, 1940) reported on the flowering of *Crinum erythrophyllum*, Carey (Bot. Mag. 47, 2121, p. 7) a species recognized by Herbert (Amaryll. 1837, p. 258), but ignored by Baker in 1888.

²³ Koshimizu, Takuji. On the "Crinum Line" in the Flora of Japan. Botanical Magazine (Tokyo) 52:135-139, 1938.

²⁴ Koshimiza, Takuji. Phytogeographical distribution of *Crinum* throughout the world. Botanical Magazine (Tokyo). 52: 32-39, 1938.

²⁵ Koshimiza Takuji. Carpobiological studies of *Crinum* in Japan (in Japanese) Botany and Zoology 1933. Bremekamp, Cornelis, E. B. Over zaden die van het gewone type afwijken en over broedknoppen, die aan zaden doen denken. (in Dutch) Tropische Natuur (Java) Spec. no. 77-82, 1936. Mery, James Formation of periderm in the endosperm of *Crinum asiaticum*. Papers. Mich. Acad. Sci. 22 (1936): 159-164, 1937.

TABLE II

Complete List of Crinum Species

[For the species marked (*) complete descriptions in English are given in the text.]

Subgenus 1. STENASTER Baker

- | | | |
|-------------------------|--------------------------|-------------------------|
| 1. asiaticum | 13. pedunculatum | *25. amboense |
| *2. Rumphi | 14. macrantherum | *26. onodongense |
| *3. Douglasii | 15. Bakeri | *27. somalense |
| *4. cortiflorum | *16. macrophyllum | 28. buphanoides |
| 5. sumatrana | 17. bracteatum | *29. Braunii |
| 6. amabile | 18. Welwitschii | *30. biflorum |
| 7. augustum | 19. mauritianum | *31. nerinoides |
| 8. defixum | 20. ligulatum | 32. caribaeum |
| 9. Wattii | 21. firmifolium | 33. cruentum |
| 10. stenophyllum | 22. leucophyllum | *34. longitubum |
| 11. serrulatum | *23. Poggei | |
| 12. pusillum | *24. Belkianum | |

Subgenus 2. PLAYTASTER Baker

- | | | |
|-------------------------|--------------------------|--------------------------|
| 35. humile | 48. uniflorum | 61. erubescens |
| 36. Cumingii | 49. angustifolium | 62. americanum |
| 37. amoenum | *50. brisbanicum | *63. oliganthum |
| 38. gracile | *51. pestilentis | *64. palustre |
| 39. Stracheyi | 52. modestum | 65. Commelyni |
| 40. Balfourii | 53. purpurascens | 66. strictum |
| 41. pratense | *54. natans | 67. undulatum |
| *42. Woodrowi | *55. Roosenianum | 68. Kunthianum |
| 43. Northianum | 56. subcernuum | 69. concinnum |
| 44. brachyandrum | 57. Hildebrandtii | *70. argentinum |
| *45. intermedium | *58. Forgetii | 71. graciliflorum |
| *46. brevistylum | 59. crassicaule | |
| 47. venusum | *60. Harmsii | |

Subgenus 3. CODONOCRINUM Baker

- | | | |
|--------------------------------------|--------------------------|---------------------------|
| 72. zeylanicum | *87. majakallense | *103. stenophyllum |
| 73. latifolium (generic type) | 88. Sanderianum | *104. polyphyllum |
| *74. Johnstoni | 89. scabrum | 105. lineare |
| 75. brachynema | *90. pedicellatum | 106. variabile |
| 76. flaccidum | *91. Boehmii | 107. campanulatum |
| 77. pauciflorum | 92. fimbriatulum | 108. imbricatum |
| *78. parvum | 93. crassipes | 109. Moorei |
| *79. Samueli | *94. Vassei | 110. Forbesianum |
| *80. Wimbushi | 95. Kirkii | 111. bulbispermum |
| 81. Careyanum | *96. Stapfianum | 112. Macowani |
| 82. abyssinicum | 97. podophyllum | 113. submersum |
| *83. yemense | *98. Rattrayii | 114. longiflorum |
| *84. Schimperi | 99. giganteum | 115. virgineum |
| 85. distichum | *100. Bequaerti | |
| 86. yuccaeiflorum | *101. congolense | |
| | *102. suaveolens | |

UNCLASSIFIED SPECIES

- | | | |
|----------------------------|---------------------------|-----------------------------|
| *116. Esquirolii | *121. crispum | *126. toxicarium |
| *117. acaule | *122. gigas | *127. Stuhlmanni |
| *118. Voyroni | *123. Eleonarae | *128. Menyharthii |
| *119. Rautanenianum | *124. glaucum | *129. tanganyikense |
| *120. Lugardae | *125. scilliflorum | *130. erythrophyllum |

SPECIES OR SYNONYMS IN GENUS AMMOCHARIS

- | | | |
|-------------------------|-------------------------|-----------------------|
| 1. Tinneanum | 5. Bainesii | 9. curvifolium |
| 2. heterophyllum | 6. Thruppii | 10. coccineum |
| 3. angolense | 7. rhodanthum | |
| 4. Baumii | 8. ammocharoides | |

After making the deductions and additions necessary due to the work cited above, there remain a total of 57 species of which descriptions are not readily available. Descriptions of these 57 species are here presented. Where necessary the descriptions have been translated into English from the Latin or other foreign languages. The names

and literature citations of all species in Baker's Amaryllideae, 1888, that are still recognized, are also included. This brings the review up to March 1942, and those interested now have access to all species descriptions of the genus *Crinum* by consulting this article and Baker's Amaryllideae, 1888.

I wish to take this opportunity of thanking the staff of the United States Department of Agriculture Library for the very efficient help that I received during the great amount of time I spent in the Library, and also for supplying microfilms and photostats of many articles needed.

II.

The subgenera set up for the Genus *Crinum* by Baker are recognized in the present review. A number of species have been placed under the heading "Unclassified" since the authors of these gave no clues as to the affinities of these with reference to species already described. The ten species formerly included in *Crinum* that Milne-Redhead and Schweickerdt have shown to be either species or synonyms in the Genus *Ammocharis* are also indicated. For the convenience of the readers a complete list of the species is given in Table II.

DESCRIPTION OF SPECIES

Subgenus 1. STENASTER Baker

1. *CRINUM ASIATICUM*, Linn., Sp. Pl. 419; Gawl. Bot. Mag. Pl. 1073; Baker, Amaryll. 1888, p. 75; *C. toxicarium* Roxb. Hort. Bengal.; *C. asiaticum* var. *toxicarium* Herb. Amaryll. Wight, Ic. Pl. 2021-2022.

Notes.—This species is widely spread in Tropical Asia. It has been illustrated by Rumphius in 1750. Baker mentions that there is a specimen in the British Museum sent from Tranquebar by the Moravian brethren in 1784. Linnaeus gives as geographical distribution "Malabaria, Zeylona, America". This will explain that the synonyms that have been cited under *C. asiaticum* Linn. contain *C. erubescens* Ait., *C. longifolium* Thumb. and *C. deflexum* Ker. *Crinum asiaticum* Linn. has been reported from the Aru Islands. Baker distinguishes a number of varieties, namely var. *declinatum* Herb. in Bot. Magaz. Plate 2231; Bury, Hexand. Plate 43. Its peduncles are assurgent and plicate. The bud is slightly cernuous; tube and limb longer than in the type. The limb is tinged with red. Known from Sillet. var. *sinicum* Roxb. Bot. Magaz. Plate 2121. Has leaves that are 12 cm. wide; their edges are clearly undulate. The scape is 90 cm. in length. Tube and segments are longer than those of the type. Reported from China.—var. *procerum* Carey; Herb. Bot. Magaz. Plate 2684. The leaves are 1.5 m. in length and at the base about 30 cm. in width. The perianth tube and limb are each 12 cm. in length, the latter being tinged with red on the outside; reported from Rangoon. *C. var. anomalum* Herb. App. Bot. Magaz. Plate 2121. *C. plicatum*, Livingst. Bot. Magaz. Plate 2908. Herbert states of this form, "It is very remarkable, because it differs from the whole genus in having the leaves split on opposite sides alternately to the base of the bulb, so that the bulb is imperfect in all its coats." He gives China as country of origin.

Hallier in his study on *Amaryllidaceae*, in Lorenz, Nova Guinea résultats de l'expédition scientifique en 1907-1909. 8:899, Leiden, 1912, indicates the occurrence of this species on the Island of Wamar in low moist lands from Merauke (South New Guinea). He also mentions that there are in the Government Herbarium in Leiden specimens from Sumatra, Java, Madura, and Celebes.

2. *C. RUMPHI*, Merrill, An Interpretation of Rumphius Herbarium Amboinense, Manila 1917.

Description.—The plant is entirely glabrous; leaves numerous, about 70 cm. in length, 18 cm. wide; petiole 20 cm. long; peduncle not known; flowers white, numerous, about 20 to each cluster; spathe-valves 18 cm. long, and 3 cm. wide, narrowed toward apex; pedicels 1 to 1½ cm. long; tube of the perianth slender, including the ovary 15 cm. long; segments linear-lanceolate, about 14 cm. long, 6 mm. broad, acute; filaments lilac; fruit unknown.

Notes.—This species, according to Merrill, belongs to the same group as *C. asiaticum*, L. from which it differs in many characteristics. Conspicuous are the large leaves and the long slender perianth-tube. Merrill states that Haskarl, Neue Schlüssel (1866) 177, thought that *Radix toxicaria II terrestris* might be the same as *C. procerum*, Carey, which, however, is synonym of *C. asiaticum*, L.

3. *C. DOUGLASII*, Bailey, in Botany: Contributions to the Queensland Flora. Bull. 4: 27, 1890.

Description.—Leaves several, deep green, about 75 cm. in length, 10 to 12 cm. wide, becoming narrower above the middle, the apex rather blunt, veins numerous, reticulated; scape somewhat compressed, dark mottled, about 75 cm. long, carrying about 20 flowers; pedicels thick, of the same length as the ovaries; bracts of the involucre membranous 10 to 12 cm. long and 2 cm. wide toward the base; tube of the perianth about 13 cm. in length; segments of the perianth short pointed, 9 cm. long; the outer, (sepals) longer and broader, 1.5 cm. wide, margins undulate; filaments about ¾ the length of the segments; segments slender, purplish-red, except near the base; anthers very slender, 1.5 cm. in length; style of same length as segments, purplish, except toward the base; stigma short, three-lobed.

Notes.—This species has been described from a specimen that flowered in the garden of Mr. L. A. Berray in Brisbane who received the plant from the Hon. John Douglas of Thursday Island. Bailey mentions that it differs from *C. asiaticum* by its columnar stem.

4. *C. CORTIFOLIUM*, Hallier, in Lorenz, Nova Guinea, 901, 1912.

Description.—A large herb; leaves broadly lorate, to 1.20 meter long, of equal width throughout, but becoming acute and subcarinate-quadrangular at the apex and terminated by a short, fleshy, semiterete, obtuse tip; thick coriaceous-herbaceous but fleshy as well at the base and along the midrib, when dry, about 1.5 mm. thick at the middle of the base, with quadrate lacunae between the nerves in transverse section, gradually becoming more slender toward the margin, at the very margin narrowly membranaceous, veinless and subpellucid; nerves and veins disappearing in the fleshy parts of the lamina, subsulcate at the margin and toward the apex on both sides; the spaces between the veins quadrate, rhomboid, becoming black, elliptic in cross-section at apex, 28 mm. long, 15 mm. wide; spathe large about 12 cm. long, 3.5 cm. wide, consisting of 2 opposite leaves, the outer clasping, the margins 2-keeled on the inside; umbel about 20-flowered; the bud including the ovary and stipe, 8 cm. long, each subtended by a linear bracteole, 2-4 mm. wide, 8-10 cm. long; external petals 3, about 3.5 cm. long, subcucullate at the apex, the 3 interior petals shorter, the anthers linear, attached dorsally a little below the middle, when young 17 mm. long; fruits pear-shaped, about 3.5 cm. long, 2 cm. thick, with the stipes about 2.5 cm. long, 2-edged, 5 mm. wide, terminating in a thick, cylindric beak irregularly broken off at the apex.

Notes.—Native to Southwest New Guinea, growing along river banks in virgin forests; Von Romer nr.189. This species is larger and much more robust than any other species known from southern Asia, Indonesia and Micronesia.

5. *C. SUMATRANA*, Roxb. Hort. Bengal. 23; Lindl. in Bot. Reg. Plate 1049. *C. rigidum* var. *sumatranum* Herb. Amaryllidac. 248; Baker, Amaryll. 1888, p. 75.

6. *C. AMABILE* Donn, Hort. Cantab. ed. 6, 83. Ker. in Bot. Magaz. Plate 1605; Baker, Amaryll. 1888, p. 75-76; *C. superbum* Roxb.

7. *C. AUGUSTUM*, Roxb., Hort. Bengal. 23. Herb. in Bot. Mag. Pl. 2397, Bury, Hexand. 64; Baker, Amaryll. 1888, p. 85; *C. amabile* var. *augustum* Gawl. in Bot. Reg. Plate 679.

8. *C. DEFIXUM* Ker. in Journ. Sci.; 105; Lodd. Bot. Cabinet. Plate 362; Herb. in Bot. Magaz. Plate 2208; Baker, 1888, p. 76; *C. asiaticum* Linn. ex parte; Roxb.; *C. Roxburghii* Dalz et Gibs. *Amaryllis vicipara* Lam.

Notes.—To this species may belong var. *ensifolium* Roxb., *C. ensifolium* Herb. Bot. Magaz. Plate 2301. The flowers are deeper red on the outside. Its leaves are more acute. The plant has a less robust appearance. Has been reported from Pegu. Herbert considers this as a species, though closely allied to *C. defixum* Ker. See also J. B. Key's Review etc. in Journ. of the Sciences and the Arts. 3:106, 1817.

9. *C. WATTII*, Baker, Amaryll. 76 (1888).

10. *C. STENOPHYLLUM*, Baker, Gard. Chron. 786 (1881); Baker, Amaryll. 1888, p. 76.

11. *C. SERRULATUM*, Baker, in Gard. Chron. 786 (1881); Baker, Amaryll. 1888, p. 76-77.

12. *C. PUSILLUM*, Herb. Amaryllid. 255 Plate 32 fig. 3; Baker, Amaryll. 1888, p. 77.

13. *C. PEDUNCULATUM*, R. Br. Prodr. 297; Ker. in Bot. Reg. Plate 52; Bury, Hexand. Plate 11; Baker, Amaryll. 1888, p. 77. *C. taitense* Red. Lil. Plate 408. *C. canaliculatum* Roxb. Bot. Magaz. Plate 2121. *C. australe* and *exaltatum* Herb. Amaryll. 246, 1837.

Notes.—This plant has been described from a specimen that flowered in Kew Gardens in 1878. Native to Australia. Bailey, who describes this species in Queensland Agric. Journ. 4:47-48, 1899, states that *C. pedunculatus* occurs along creeks of the Brisbane River. He makes the remark "As there exists considerable confusion in the nomenclature of the Australian species of this genus, I deem it necessary to publish fresh descriptions, drawn up from living plants of the Queensland species, as opportunities offer."

14. *C. MACRANTHERUM*, Engl. Jahrb. 5:448; Baker, Amaryll. 1888, p. 77.

15. *C. BAKERI*, Schumann, in Engl. Bot. Jahrb. 4:194; Baker, Amaryll. 1888, p. 77.

16. *C. MACROPHYLLUM* Hallier in Lorenz, Nova Guinea 899, 1912.

Description.—Bulb unknown; leaves glabrous, large, lanceolate, acute, to 12 cm. long and 12 cm. wide, clearly parallel veined; scape carries about ten flowers; spathe 13 cm. long, the base 2 cm. wide; tube of perianth slender, cylindric, white, greenish

toward the outside; ovary 13 to 16 cm. long, about 2 mm. thick; filaments 7 to 8 cm. long, upper half purplish; anthers straight, 2 to 2.5 cm. long and 1 mm. wide.

Notes.—Native to Southeast New Guinea, along the river banks between van Weels Camp and Sabang. Versteeg nr. 1219. This species differs from *C. macrantherum*, Engl. by its smaller leaves with closer veins, shorter perianth tube and much larger and broader lobes of the corolla; anthers arrow-like at the base. Hallier states that this species can easily be distinguished from *C. Bakeri*, K. Schum.

17. *C. BRACTEATUM*, Willd. Spec. Plant. Tom. II:47; Jacq. Hort. Schoen. IV: Plate 495; Gawl. in Bot. Reg. Plate 179. Baker, Amaryll. 1888, pp. 77-78; *C. brevifolium* Roxb. Hort. Bengal. *C. asiasticum* var. *bracteatum* Herb. Amaryllidac. 243.

18. *C. WELWITSCHII*, Baker., Gard. Chron. 40 (1881); Baker, Amaryll. 1888, p. 78.

19. *C. MAURITIANUM*, Lodd., Bot. Cab. Plate 650; Baker, Amaryll. 1888, p. 78.

20. *C. LIGULATUM*, Baker, Journ. Linn. Soc. 20:270; Baker, Amaryll. 1888, p. 78.

21. *C. FIRMIFOLIUM*, Baker, Journ. Linn. Soc. 20:270; Baker, Amaryll. 1888, p. 78.

22. *C. LEUCOPHYLLUM*, Baker, Bot. Magaz. Plate 6783; Baker, Amaryll. 1888, p. 78.

23. *C. POGGEI*, Pax, Engler Bot. Jahrb. 15:141, 1893.

Description.—Bulbs and leaves unknown; scape robust, short, 1 cm. in diameter; There are to 30 flowers to each umbel; spathe-valves 3.5 cm. long, 2 cm. wide at the base, dry membranaceous, yellowish; pedicels hardly 6 to 12 mm. in length; ovary 3 cm. long; flowers probably pure white; length of the perigon-tube 8 cm.; segments of the perigone 3 to 5 cm. in length; anthers about 5 mm. long.

Notes.—This species has been reported from Quango. L. Pogge nr. 422. It is related to *C. leucophyllum*, Baker, from which it differs by the long, thin narrow tube of the perigone and the very narrow segments of the perigone.

24. *C. BELKIANUM*, Schinz, Bull. Boiss. IV App. III 47, 1896.

Description.—Leaves ensiform, about 35 cm. in length and about 3.5 to 5 cm. wide at the base, the apex attenuate, the margins scabrous; scape many-flowered, flowers pedecellate; perianth tube erect, about 10 cm. in length; segments elliptic, acute and attenuate at the base and about 5 cm. or slightly more in length and nearly 5 cm. wide; filaments about 5 cm. long.

Notes.—According to Schinz this species is related to *C. leucophyllum*, Hook. and *C. Bainesii*, Baker. The former has much broader leaves, whereas *C. Bainesii* has a shorter flower tube and shorter petals. Both species show affinity to *C. Tinneanum*, Kotschy. The plant is known from Tropical Africa.

25. *C. AMBOENSE*, Baker, Schinz, Beitrage zur Kenntnis der Afrikanische Flora. Bull. Herb. Boiss. 3 II Ser.:666, 1903.

Description.—Bulb of medium size; leaves lanceolate, 90 cm. in length and 3 poll wide, apex attenuate, glabrous, flaccid, margin denticulate; peduncle about 6 lin. in diameter; peduncle about 6 lin. in diameter; umbel many-flowered, pedicels 12 to 15 lin. long; Spathe-valves ovate-lanceolate, 2 poll. in length; ovary cylindric; perianth-tube slender, erect, 4 poll long; segments lanceolate, open or recurvate, 2 to 2½ poll long and 2½ to 3 lin. wide, 5 to 7 veined, white; anthers 3 lin. in length.

Notes.—Collected in Southwest Africa: Amboland, Olukonda. This species shows relationship with *C. Belckianum*, Schinz.

26. *C. ONDONGENSE*, Baker, in Schinz, Beitrage zur Kenntnis der Afrikanische Flora. Bull. Herb. Boiss. 3 II Ser. 666-667, 1903.

Description.—Bulb globose, 4 poll in diameter, neck distinct; Leaves lanceolate, 1 poll wide, apex attenuate, margins denticulate; scape is 1½ lin. in diameter; umbel 10 to 12 flowered; spathe valves lanceolate, pedicels 6 to 12 lin. long; perianth reddish, tube slender, erect, 2 poll long; segments of the limb lanceolate, 5 to 7 veined, 1½ poll long; stamens shorter than the perianth; filaments reddish; anthers linear, yellow.

Notes.—Native to South West Africa: Amboland, Ondonga. Rautanen p. III, 1886.

27. *C. SOMOLENSE*, Chiovenda, in Risultati Scientifici della Missione Stephani-Paoli, nella Somalia Italiana. Vol. I:229-230, 1916.

Description.—Bulb unknown; leaves strap-shaped, about 30 cm. long, subcoriaceous, closely veined, margins carthilageous; scape more or less compressed; umbel 15 to 20-flowered; spathe-valves 10 to 13 cm. long, broad ovate, 2.5 to 3 cm. wide;

pedicels 1.5 to 4 cm. long; ovary oblong, perianth tube about 5.5 cm. long, 3 mm. in diameter; limbs linear-lanceolate, red, segmented; filaments $\frac{2}{3}$ of the length of the segments, purple; anthers linear, 14 mm. long; style filiform; capsule sub-globose about 7 cm. long and 6 cm. wide.

Notes.—This species is related to *C. ammocharoides*, Baker. This species is a native to Somaliland.

28. *C. BUPHANOIDES*, Welwitsch, MSS.; Baker, in Journ. Bot. 195 (1878); Baker, Amaryll. 1888, p. 80.

29. *C. BRAUNII*, Harms, in Notizblatt Kgl. Bot. Garten und Herb. Berlin. 1:19-21, 1895.

Description.—Bulbs large, above the ground, 10 to 12 cm. in diameter, covered by dirty-red, thick solid scales; leaves more or less linear, 70 to 100 cm. in length, toward the center 5 to 5.5 cm. wide; margins sharp, white-edged; very finely, irregularly dentate; leaves have, in the middle, along their entire length a deep, broad furrow, apex is bent downward; type specimen had 12 leaves; scape about 70 cm. long, elliptic in cross section; about 6 flowers per umbel; spathe-valves broad, about 5 cm. long, brownish-yellow, membranaceous; flowers erect, sessile, without scent; perigone-tube narrow, about 15 cm. long, furrowed, light green, the upper part whitish; segments linear, 10 cm. long, toward the middle about 8.5 mm. wide, inner side and part of outside white, pink along the margins; filaments about 5.5 to 6 cm. long, the lower $\frac{1}{3}$ white, the upper part dark red; anthers a little over 1.25 cm. long; ovary 1.8 cm. long; style 20 cm.

Notes.—Native to Madagascar; introduced by J. Braun. It flowered during 1894 in the Botanical Garden of Berlin. Harms states that this beautiful species can not properly be compared with any others. On account of the linear leaves it belongs to the subgenus of *Stenaster*. It differs from the madagascarian *C. firmifolium*, Baker, by its narrow leaves. There is some resemblance to *C. mauritianum*, Loddiges.

30. *C. BIFLORUM*, Baker, in Warb. Qunende Sambesi Expedition 565, 1903.

Description.—Bulb unknown; leaves linear, 8 to 9 lin long, attenuate; scape two-flowered, pedicels short; spathe-valves lanceolate; ovary cylindrical; perianth tube 5 poll long; segments lanceolate, 3 lin long; anthers linear, 5 to 6 lin long.

Notes.—This species is native to Kuito, Longa at an elevation of 1150 meter. Her. nr. 543, 1899.

31. *C. NERINOIDES*, Baker, in Schinz, Beitrage zur Kenntnis der Afrikanische Flora. Bull. Herb. Boiss. 3 II Ser. 666, 1903.

Description.—Bulbs and leaves unknown; peduncles slender, short, 1 to $1\frac{1}{2}$ lin. in diameter; umbel composed of 7 flowers; pedicels 9 to 12 lin. long; spathe-valves lanceolate, membranous, 18 lin. long; perianth red, tube slender; perianth segments 17 lin. long and $1\frac{1}{2}$ to 2 lin. wide, 5-veined; anthers 2 lin. long.

Notes.—Native to Southwest Africa: Hereroland. Dr. Done p. 17. XII, 1892.

32. *C. CARIBAEUM*, Baker, Gard. Chron. 40 (1881). *C. floridanum* Griseb. Flora Brit. West Ind. 583 non Fraser; Baker, Amaryll. 1888, p. 80.

33. *C. CRUENTUM*, Gawl., Bot. Reg. Plate 171; Lodd. Bot. Cab. Plate 346; Bury, Hexand. Plate 22; Baker, Amaryll. 1888, p. 80.

34. *C. LONGITUBUM*, Pax, Engler Bot. Jahrb. 15:141-142, 1893.

Description.—Bulbs and leaves unknown; scape robust, short, 1.25 cm. or less in diameter; 20 flowers or more per umbel; pedicels 3.5 cm. long; Spathe 8 cm. long and 3.2 cm. wide, dry-membranaceous, yellowish; flowers probably white; perigone tube nearly 12 cm. long or longer; perigon segments nearly 7 cm. long; anthers less than 1.25 cm. long, versatile; ovary 1.2 cm. long and less than 6 mm. wide.

Notes.—Native to Angola (Teuscz Exped. v. Mechow nr. 294). This species is related to *C. leucophyllum*, Baker, its flowers are, however, longer pedicelled, and have longer perigone-tubes, whereas the segments are narrower. *C. Poggei*, Pax, is a distant relative.

Subgenus 2. PLATYASTER Baker

35. *C. HUMILE*, Herb., Bot. Magaz. Table 2636; Baker, Amaryll. 1888, p. 81.

36. *C. CUMINGII*, Baker, Gard. Chron. 72 (1888); Baker, Amaryll. 1888, p. 81.

37. *C. AMOENUM*, Roxb., Hort. Bengal. 23; Baker, Amaryll. 1888, p. 81.

38. *C. GRACILE*, Meyer, Presl Rel. Haenk. 2 : 120; Baker, Amaryll. 1888, p. 81.
 39. *C. STRACHEYI*, Baker, Gard. Chron. 72 (1881); Baker, Amaryll. 1888, p. 81-82.
 40. *C. BALFOURII*, Baker, Bot. Magaz. Plate 6570; Baker, Amaryll. 1888, p. 82.
 41. *C. PRATENSE*, Herb., Amaryllidac. 256 (1837). *C. longifolium* Roxb. in Hort. Bengal. 23 non Thunb; Baker, Amaryll. 1888, p. 82.

42. *C. WOODROWI*, Baker, Bot. Mag. Plate 7597, 1898.

Description.—Bulbs round, about 10 cm. in diameter, without distinct neck; bulb surrounded by brown, membranous scales; leaves few; contemporaneous with flowers; 30 cm. leaves ligulate, blunt, glabrous, bright green, 30 cm. in length and 7 to 10 cm. wide; not ciliated along the margins; flower-stalk compressed, arising from bulb on side of mass of leaves, 30 cm. in length; 6 to 7 flowers per umbel; pedicels about 2.5 cm. in length; spathe-valves two, ovate, opposite; perianth tube cylindric, 7 to 78 cm. in length; segments white, lanceolate, equally spreading and of same length as tube; filaments deep red, half the length of segments; anthers linear, 8.5 mm. in length; style overtops anthers.

Notes.—This species is native to Central India. Baker states that several bulbs were sent to the Royal Botanical Gardens at Kew in 1897 by Mr. G. W. Woodrow. The species is allied to *C. Balfourii*, Baker, from the Island of Socotra, to *C. Northianum*, Baker, from Borneo, apparently; to *C. amoenum*, Roxb., and also to *C. pratense*, Herb. The last two are native to India.

43. *C. NORTHIANUM*, Baker, Gard. Chron. 671 (1882); Baker, Amaryll. 1888, p. 82.

44. *C. BRACHYANDRUM*, Herb., Amaryllidac. 249 (1837); Baker, Amaryll. 1888, p. 83.

45. *C. INTERMEDIUM*, Bailey, Queensland Agric. Journ. N. S. 1:124, 1919.

Description.—Bulbs 5 to 7 cm. in diameter, and without stem above ground; leaves end in a more or less blunt point, and are furnished by numerous longitudinal veins, the horizontal ones form a faint tessellation; scape, compressed, glaucous, showing a reddish tinge at base; bracts large; bracteoles slender; perianth segments with apiculate yellow tips.

Notes.—This species has been reported from Wai Weir Island. The name because it resembles both *C. Douglasii*, Bail., and *C. brevistylum*, Bail. The plants were sent from Wai Weir Island in June 1911 to the Director of the Brisbane Botanical Gardens.

46. *C. BREVISTYLUM*, Bailey, Queensland Agric. Journ. 2:197-198, 1898.

Description.—Bulb roundish, egg-shaped, 10 to 12 cm. in diameter, without distinct neck, instead it forms yearly a crown of 12 to 14 slaty-green leaves; leaves ensiform, somewhat erect, 60 to more than 90 cm. in length, and 6 cm. broad toward the middle, the apex rather blunt; often more than one scape grows from between the leaves; scape 60 to 75 cm. in length, flattened, 2 to 2.5 cm. wide; bracts of involucre 6 to more than 7 cm. in length, somewhat blunt, and 2.5 cm. wide at base; 8 to 10 flowers per inflorescence; pedicels thick, short, sometimes as long as the ovary which is about 1.25 cm. in length; flowers white, slightly scented; tube erect, green or greenish, 7 to 12 cm. long, somewhat angular; segments linear-lanceolate, about 6 cm. long, 2 to 2.5 cm. wide toward center; outside segments with green tips; stamens erect, and reach half the length of segments; upper half of the filaments purplish-pink, in some cases white; anthers narrow, 1.25 cm. in length; style surrounded by the tube, upper 2/3 of style purplish; stigma obtusely lobed.

Notes.—Bailey reports this species from Turtle Island, Queensland where plants were found on sandy patches above high-water mark. He states "The species agrees in some respects with the lost species *C. brachyandrum*, Herb., but not in my opinion sufficiently to allow being placed under that name." For this reason I place *C. brevistylum* in this contribution close to *C. brachyandrum*.

47. *C. VENOSUM*, R. Br., Prodr. 1:297; Baker, Amaryll. 1888, p. 83.

48. *C. UNIFLORUM*, Muell. Fragm. 3:23; Baker, Amaryll. 1888, p. 83.

49. *C. ANGUSTIFOLIUM*, R. Br., Prod. 1:297; Baker, Amaryll. 1888, p. 83-84; *C. australascium*, Herb., var *angustifolium*, R. Br.

50. *C. BRISBANICUM* Bailey Contrib. to Queensland Flora in Queensland Agric. Journ. 4:47-48, 1899.

Description.—Bulbs to 4 cm. in diameter, without a neck; leaves 5 to 6, deep green, 50 cm. long, and about 1.25 cm. wide, linear, the margins somewhat rough;

scape to 40 cm. long, flat, cylindrical, hardly 1.25 cm. in thickness at the base; flowers about 10 per umbel, erect; bracts 2, 5 to 7 cm. long, inner-ones or bracteoles thread-like; pedicels 1.2 to 1.5 cm. long; ovary 6 mm. long; perianth tube slender, 7 cm. long; segments white with greenish tips, lanceolate, 5.5 cm. long and 1.25 cm. wide; stamens to about half the length of the segments, the ones situated opposite the outer segments are shorter than the others; filaments deep pink; anthers 6 cm. long; slightly longer style has the same color as the filaments; flower-buds drooping, pink on the outside.

Notes.—This species has been reported from sandy land near the coast, Brisbane River, Queensland. Judging from the description, it occurs that this species might be grouped under the subgenus of *Platyaster*.

51. *C. PESTILENTIS*, Bailey, Queensland Agric. Journal 2:198, 1898.

Description.—Bulb eggshaped to roundish, 7 to 10 cm. in diameter, growing about 25 cm. below the surface of the soil; leaves, linear, deep green, 60 cm. or more in length, of firm texture, with rough margins; flower-stalk, compressed, 30 to 45 cm. long; flowers, pure white, sometimes pinkish on outside; about 10 flowers per inflorescence; bracts of the involucre about 7 cm. long, and 2 cm. wide at base; narrowed to a point toward apex, in other cases almost linear with a broader end; pedicels 1.25 to 1.3 cm. in length; "ovaries beaked, about equal in length with the pedicels"; perianth tube 8 cm. long; segments 7 to 10 cm. long, 2.5 cm. wide in the middle, outer ones with subulate points; filaments white, not declinate, about half the length of the segments; anthers about 8.5 mm. in length; style, slender, almost as long as the segments; its upper half slightly green; stigma very small.

Notes.—This species was found along the Bulloo River, Queensland. Bailey states "I was led to give the above name to the present species from the fact that persons camping in places where it is flowering in quantities being apt to be seized with violent vomiting. I myself felt unwell from the odour of a single flower in a room." This species may be related to *C. angustifolium*, R. Br., var. *blandum*, Roem. However, it is apparently placed by Bentham in Flora Austral. under the name of *C. flaccidum*, Herb.

52. *C. MODESTUM*, Baker, Journ. Linn. Soc. 22:528; Baker, Amaryll. 1888, p. 84.

53. *C. PURPURASCENS*, Herb., Amaryll. 250 (1837); Baker Bot. Magaz. Plate 6525; Baker, Amaryll. 1888, p. 84.

54. *C. NATANS*, Baker, Thiselton-Dyer, Flora of Tropical Africa. 7:396, London 1898.

Description.—An aquatic species; bulbs small, narrow-ovoid, forming many long roots; leaves to 20, submersed, strap-shaped, membranous, waved, 90 cm. in length and 2.5 to 3.5 cm. wide at the middle; umbel, flowers and stamens resemble those of *C. purpurescens*, Herb. though they "are more strongly developed."

Notes.—This species has been reported from Upper-Guinea. Sierra Leone near Franziga, *Scott Elliott nr. 4732*, near Kurusa, *Scott Elliott nr. 5542*. Gold Coast, *Burton and Cameron*. Fernando Po in fresh water streams. *Mann nr. 1416*. Niger Delta found in running water. *Kirk*.

55. *C. ROOZENIANUM*, O'BRIEN, Gard. Chron. 9, III, Ser.:701, 1891.

Description.—The morphological description of this species is very wanting; no special data are given. The plant comes closer to *C. americanum*, L. than it does to *C. erubescens*, Ait. O'Brien considers it distinct enough to make it a separate species. Though its growth resembles somewhat *C. erubescens* Ait., it is like *C. americanum* L. in the longer, more slender perianth tube, curved at the top. It is also stated that "it more nearly resembles *C. purpurascens*, Herb., than any other species."

Notes.—*C. Roozenianum* came from Jamaica and was included in the collection of Ant. Roozen & Son, Overveen, Netherlands. It has been reported to have flowered in the collection of Sir Chas. W. Strickland, Bart, at Hildenley, Malton, Yorks.

56. *C. SUBCERNUM*, Baker, Gard. Chron. 180 (1881); Baker, Amaryll. 1888, p. 84.

57. *C. HILDEBRANDTII*, Vatke, Monat. Kgl. Acad. Wiss. Berlin 863 (1876), Baker in Bot. Magaz. Plate 6709; Baker, Amaryll. 1888, p. 84.

58. *C. FORGETTI*, Wright, Bull. Misc. Inform. Kew. 283-284, 1925.

Description.—Leaves oblong-lanceolate, acute or short acuminate, amplexicaule at the base, 35 cm. long and nearly 7 cm. wide, margins minutely denticulate; scape lateral, sub-cylindric, about 30 cm. high and 1.2 cm. in diameter, five-flowered;

spathe deltoid, 8 cm. long; flowers sessile; perigone tube green, 20 cm. long, 5 mm. diameter; segments ligulate, acuminate, white, revolute about 8 cm. long, less than 1.2 cm. wide; filaments subulate, red, to 5 cm. in length; anthers oblong, 1.2 cm. long; ovary oblong, somewhat over 1.2 cm. long, greenish; style red, a little longer than the stamens; stigma roundish.

Notes.—Native to Peru; no definite locality is given. This species shows some affinity to *C. Hildebrandtii*, Vatke, on account of its long perigone tube but the leaves are shorter. This species has been described from a plant flowering in Kew Gardens which was received from the firm Sander & Sons.

59. *C. CRASSICAULE*, Baker, Amaryll. 1888, p. 85.

60. *C. HARMSII*, Baker, Warb. Kunene Sambesi Expedition, p. 565, 1903.

Description.—Bulb unknown; leaves 2 poll wide; distinctly denticulate and ciliate; peduncle 6 to 7 lin in diameter; 3 flowers to the umbel; pedicels short; spathe-valves lanceolate, 4 to 5 poll long; ovary cylindrical; perianth tube erect, red, 4 poll long; segments of the limb oblong-lanceolate, 6 to 7 lin wide, attenuate at the apex and base; anthers yellow, 4 lin long.

Notes.—Reported from Kuebe, Matangue, Sambesi at an elevation of 1250 meters. Her. nr. 330, 1899.

61. *C. ERUBENSCEUS*, Ait., Hort. Kew. 1:413; Red. Lil Plate 27. Jacq. Hort. Schoen. Plate 494; Lodd. Bot. Cab. Plate 31, Gawl. in Bot. Magaz. Plate 1232, Baker, Amaryll. 1888, p. 85.

62. *C. AMERICANUM*, Linn., Spec. Plant. 1; 419 (1753); Gawl. in Bot. Magaz. Plate 1034; Baker, Amaryll. 1888, p. 85-86.

Notes.—Occurs in marshes, swamps and banks of rivers in the southern part of the United States from the Coastal Plain, Florida to Texas.

63. *C. OLIGANTHUM*, Urban, Sertum Antillarum IV in Rep. Spec. Nov. Reg. Veg. Fasc. 15:100, 1919; *C. erubescens* Griseb. Cat. Cub. 250, 1866 (non Soland); *C. americanum* Ch. Wright in Anal. Acad. Cienc. Habana 8:52, 1871. Sauv. Flore Cub. 166 nr. 2496 (non L.)

Description.—Bulb cylindric to 5 cm. long, and 2 cm. thick; leaves 3 to 4, linear, 30 to 35 cm. long, 1.2 to 2.5 cm. wide, erect; margins minutely denticulate; scape 20 to 25 cm. long, compressed, 4 to 6 mm. thick; bracts linear, apex obtuse, 3.5 to nearly 7 cm. long; umbel 1-2 flowered; pedicels absent or almost absent; perianth tube 8 to 12 cm. long; segments linear-lanceolate, acuminate at the apex, 5 to 6 cm. long and 8 to 10 mm. wide; stamens somewhat shorter than the perianth segments; anthers linear, 9 mm. long; stigma minutely lobed; ovary 1.20 to 1.50 cm. long.

Notes.—Native to Cuba. Wright nr. 3244 in the province of Habana prope Batámano.

64. *C. PALUSTRE*, Urban, Sertum Antillarum IV. in Rep. Spec. Nov. Rep. Veg. Fasc. 15:101, 1919.

Description.—Bulbs and leaves unknown; scape compressed, 7 mm. thick; bracts lanceolate with an obtuse apex, about 7 cm. long and 2 cm. wide; about 6 flowers per inflorescence; pedicels wanting; perianth tube 15 to nearly 20 cm. long, erect and arcuate; segments of the limb lanceolate to linear-lanceolate, acuminate toward the apex, 7 to 8 cm. long and 8 to 12 mm. wide; stamens shorter than the segments; anthers linear, 15 mm. long; style shorter than the corolla; stigma small; ovary oblong-lanceolate, about 3 cm. long.

Notes.—Native to Haiti, near Port-au-Prince where it grows in marshes. Jaeger nr. 149.

65. *C. COMMELYNI*, Jacq., Hort. Schoen. Plate 202; Baker, Amaryll. 1888, p. 86; *C. Commelinianum*, Herb., Amaryllidac. 254 (1837); *C. attenuatum*, Willd.; *C. Lindleyanum*, Herb., Amaryllidac. 252 (1837); *C. revolutum*, Lindl.; *C. viridifolium* Roemer.

Notes.—Native to Guiana and the Amazone River; closely related to *C. erubescens*. The plant was named in honor the Johan Commelin, Counselor of the City of Amsterdam who published the beautiful illustrated folio Horti Medici Amstelodamensis Rariorum. Beschrijfinge en Curieuse Afbeeldinge van rare vreemde Oost—West Indische en andere Gewassen. Amsterdam 1697 and 1701. The name *C. Commelyni* given by Jacquin, and being the first, is maintained.

66. *C. STRICTUM*, Herb., Bot. Magaz. Plate 2635; Baker, Amaryll. 1888, p. 86; *C. Herbertianum*, Roem. et Schultes.

67. *C. UNDULATUM*, Hook., Exot. Flora. Plate 200; Baker, Amaryll. 1888, p. 86.
 68. *C. KUNTHIANUM*, Roem., Amaryll. 80; Baker, Amaryll. 1888, p. 86; *C. erubescens*, H. B. K., non Ait.

69. *C. CONCINNUM*, Mart., Roem. et Schultes, Syst. Veg. 7:857; Baker, Amaryll. 1888, p. 87.

70. *C. ARGENTINUM*, Pax, Engler Bot. Jahrb. 11:325-326, 1890.

Description.—This species is known from its flowers only; outer bracts of the spathe membranaceous, the inner filiform; perigone tube erect, broad, cylindric, segments obovate-oblong, white; filaments erect, little shorter than the segments, anthers versatile; style filiform as long as the perigone; stigma trifid.

Notes.—Native to Argentina: San Javier; Sierra de Tucuman (11.80 leg. F. Schultz). This species is of interest from a geographical standpoint on account of the extreme distribution toward the southernmost part of South America. It's known from an andine, extra tropical region in contrast to all other species of the subgenus *Platyaster* which are native to the tropics or subtropics. *C. argentinum*, Pax, is characterized by its three-parted stigma, which gives it an isolated place among the species of this genus.

71. *C. GRACILIFLORUM*, Kunth et Bouche, Ind. Sem. Hort. Berol. 1844; Baker, Amaryll. 1888, p. 87.

Subgenus 3. CODONOCRINUM

72. *C. ZEYLANICUM*, Linn., Syst. Veg. 263; Baker, Amaryll. 1888, p. 87; *Amaryllis zeylanica*, Linn., Spec. Plant. 1:421 (1753). *A. ornata* Bot. Magaz. plate 1171. *C. Herbertianum* Wall. Pl. Asiat. Rar. Plate 145. *C. Wallichianum* Roem. *C. ornatum* var. *zeylanicum* and var. *Herbertianum*.

73. *C. LATIFOLIUM*, Linn., Spec. Plant. 1:419 (1753). Lindl. in Bot. Reg. Plate 1297; Wight Ic. Plate 2019-2020; Baker, Amaryll. 1888, p. 87-88; *C. ornatum* var. *latifolium*, Herb Amaryllidac. 263 (1837).

74. *C. JOHNSTONI*, Baker, Bot. Magaz. 128 : Plate 7812, 1902.

Description.—Bulbs globose, 7 to 10 cm. in thickness; without a distinct neck; leaves about 20, bright green, 1.2 to 1.5 meter in length, and 5 to 6 cm. wide, outer ones are ensiform, inner ones linear; flower-stalks relatively stout, 60 cm. in length; many flowers per inflorescence; pedicels about 2.5 cm. in length; spathe-valves two, lanceolate, deltoid, 5 to 7.5 cm. in length; perianth-tube slightly curved, tinged with green, 10 cm. long; limb shorter than the tube; segments acute, ovate to oblong, slightly colored pink on the outside; stamens declinate, almost as long as the limb; anthers linear, 80 mm. long; style overtops the anthers.

Notes.—This species has been reported from British Central Africa; bulbs of *C. Johnstoni* were sent in 1899 from Mount Zoma (40 miles from Blantyre, British Central Africa) by Mr. McClonnie to the Royal Botanical Gardens at Kew. This species stands between *C. latifolium*, L. and *C. longifolium*, Thunb. It resembles the former species in the flowers and the latter in relation to its long narrow leaves which gradually end in a point. It should also be noted that the leaves of *C. Johnstoni* are bright green whereas those of *C. longifolium* are described as glaucous. The plant has been named in honor of the late Sir Henry Hamilton Johnson, K. C. B., Administrator of the Uganda Protectorate.

75. *C. BRACHYNEMA*, Herb., Bot. Reg. Plate 1842, Misc. No. 28; Hook fil in Bot. Magaz. Plate 5937. Flore des Serres Plate 2303; Baker, Amaryll. 1888, p. 88.

76. *C. FLACCIDUM*, Herb., Bot. Magaz. Plate 2133; Baker, Amaryll. 1888, p. 88; *Amaryllis australasica*, Ker. in Bot. Reg. Plate 426.

77. *C. PAUCIFLORUM*, Baker, Journ. Bot. 195 (1878); Baker, Amaryll. 1888, pp. 88-89.

78. *C. PARVUM*, Baker, Kew Bull. 284, 1897, ex affinitate *C. pauciflorum*, Baker.

Description.—Bulb egg-shaped, small; leaves 5 to 7; linear and glabrous, 6 to 9 poll long, and in the middle 6 to 7 lin wide; scape slender, one-flowered and almost as long as the leaves; spathe-valves lanceolate; perianth sessile: tube cylindrical, erect, 3 poll long; segments laciniate, red striped, 3 poll long and 6 lin wide; anthers 3 to 4 lin long.

Notes.—Native to Tropical Africa, known from along the banks of the Zambesi River. One of the first specimens flowered in the collection of W. E. Gumbleston, Queenstown, Ireland in May 1896.

79. *C. SAMUELI*, Worsley, Gard. Chron. 32. 304, 1902.

Description.—Bulbs and leaves have not been described in detail; Worsley states that *C. Samueli* resembles *C. Wimbushi*; flowers sessile, 11 cm. across; umbel 2-flowered; perianth tube erect until full anthesis when it inclines slightly due to its weight; stamens spreading; anthers gray; style not as ascending as in *C. Wimbushi* to which this species is related.

Notes.—According to Worsley this species is native to Central Africa although there exists some doubt as to the exact locality.

80. *C. WIMBUSHI*, Worsley, Gard. Chron. 32: 303-304, 1902.

Description.—Bulbs round, 7.5 cm. in diameter, and 6.5 cm. in length; neck distinct, but short; tunics loose and brittle; leaves from 11 to 12, deeply channeled, spreading, edge entire, apex long, finely pointed; leaves 1.2 meter in length and 6.3 cm. in width; scape erect, 4 to 5 cm. in height, bearing two to six flowers; flowers sub-erect and sub-campanulate, white shaded with pink, fragrant; pedicels hardly 1.2 cm. in length; perianth tube 7.5 to 9 cm. long, somewhat curved; inner segments 2.5 cm. in width, the outer less than 2 cm. wide; limb cone-shaped, with narrow apex; filaments somewhat shorter than segments; upper half of filaments pink; style ascending and larger than the stamens; stigma capitate, not distinctly lobed.

Notes.—Native to Kota-Kota by Lake Nyassa, Central Africa where this species was first collected by the Rev. John Wimbush. The first plants flowered in 1898 in the collection of Mr. Worsley, Isleworth, England. It is regarded that this species is related to *C. pauciflorum*, Baker, from which it differs in the leaves and the number of flowers. The perianth tube is shorter. The flowers resemble those of *C. longiflorum*, Thumb.

81. *C. CAREYANUM*, Herb., Bot. Magaz. Plate 2466; Baker, Amaryll. 1888. p. 89.

82. *C. ABYSSINICUM*, Hochst., Schimp. Pl. Abyss. no. 1374; Baker, Amaryll. 1888, p. 89.

83. *C. YEMENSE*, Deflers, Voyage en Yemen, Journal d'une Excursion Botanique faite en 1887. 209 Paris 1889.

Notes.—There is apparently no description of this species. It is indigenous around Mount Schibam (Haraz) and Mount Kahil at an elevation of 23 to 2400 meter. (Exs. nr. 335). This species is related to *C. abyssinicum*, Hochst., hb. Schimp. Abyss. sec. II, nr. 1374, from which it mainly differs by its umbel, (more than 10-20 flowered) and by the very amplified dimensions of the perianth which attains a length of 20 to 22 cm.

84. *C. SCHIMPERI*, Schumann, Gartenflora. 38:561, plate 1309, 1889.

Description.—Bulb depressed globose, covered by yellow-grayish scales, 5 to 6 cm. in diameter, neck distinct; leaves 6 to 7, lorate, erect, arcuate, bluish-green, 40 to 50 cm. in length and 2.5 to 3 cm. wide; scape 15 to 20 cm. in length, and 2.5 to 3 cm. in thickness; spathe valves fleshy-red, 3.5 cm. in length; ovary 0.8 to 2 cm. in length and 8 mm. in diameter, distinctly sessile; perigone-tube white 8.5 to 11 cm. long; segments 6 to 7 cm. long and 1.8 cm. wide; stamens 3.5 to 5 cm. in length; anthers black, moon-shaped nearly 1.2 cm.; style 15 cm. long.

Notes.—This species is, according to Shumann, probably related to *C. abyssinicum*, Hochst., from which it differs by its blue-green and longer leaves, the non-green bracts of the spathe, the considerable length of the perigone-tube, and the relatively long filaments.

85. *C. DISTICHUM*, Herb., Amaryllidac. 260 (1837); Baker, Amaryll. 1888, p. 89; *Amaryllis ornata*, Gawl., in Bot. Magaz. 1253.

86. *C. YUCCAEFLORUM*, Salisb., Parad. Plate 52; Baker, Amaryll. 1888, pp. 89-90; *C. yuccaeoides*, Herb., var. of *C. Broussonettianum*, in Herb. Amaryllidac. 260 (1837). Lodd. Bot. Cab. Plate 668; Bury Hexand. Plate 21; *Amaryllis Broussonetii*, Red. Lil., Plate 62. *A. spectabilis*, Sndr., Bot. Rep. Plate 390. *A. ornata*, Ait.

87. *C. MAJAKALLENSE*, Baker, Thiselton-Dyer, Flora of Tropical Africa. 7:399. London 1898.

Description.—Bulb unknown; leaves linear, firm, 2 cm. in width; margins denticulate; scape relatively slender; three flowers per umbel; pedicels very short; spathe-valves oblong, acute, 7.5 cm. in length; perianth tube curved, 10 cm. in length; segments oblong, acute, connivent, 7.5 cm. in length, bright red with a broad band on the back; stamens considerably shorter than the perianth segments.

Notes.—Native to Lower-Guinea where it has been reported from Majakalla near the Kuango River. *Mechow* nr. 520. Baker states that this species is apparently related to *C. yuccaeiflorum*. Salisb.

88. *C. SANDERIANUM*, Baker, Gard. Chron. 22:102; Florist and Pomol. 157 (1784); Baker, Amaryll. 1888, p. 90; *C. ornatum*, Bury Hexand. Plate 18. *C. Broussonetianum* var. *pluriflorum*, Herb. Amaryllidac. 260 (1837).

89. *C. SCABRUM*, Herb., Bot. Magaz. Plate 2180. Bury Hexand. Plate 32; Baker, Amaryll. 1888, p. 90; *C. scaberrimum*, Herb.

90. *C. PEDICELLATUM*, Pax, Amaryllidaceae africanae. Engler Bot. Jahrb. 15:142, 1893.

Description.—Bulbs and leaves unknown; scape robust bearing about 9 flowers; pedicels 5 cm. in length; spathe of original specimen was dried and partly dropped off, about 6 cm. long, the base 2 cm. wide, acute; perigone curved, funnel-shaped, perigone-tube 10 cm. long; segments 8 to 9 cm. long, 2 cm. wide; anthers curved, about 0.6 to 1.2 cm. long; ovary a little over 1.2 cm. in length, and 0.6 cm. thick; style about 10 cm. long.

Notes.—Native to East Africa; Victoria Nyansa; between Maga and Kagehi. Fischer nr. 592. This species is related to *crinum scabrum*, Herb., which is widely distributed in Africa; it differs from it by its pedicellate flowers.

91. *C. BOEHMII*, Baker, Schinz, Beitrage zur Kenntnis der Afrikansiche Flora. Bull. Herb. Boiss. 3 II Ser. :666, 1903.

Description.—Bulbs unknown; leaves lanceolate, 60 to 90 cm. in length and 2 poll wide, the apex becoming gradually attenuate, closely veined, the margins denticulate; scape lin. in diameter; umbel sessile, 6-flowered; spathe-valves ovate-lanceolate, ascending, 4 poll long; perianth tube adnate, 4 to 5 poll. long; segments of the limb oblong lanceolate, 4½ poll. long and 9 to 10 lin. wide, white, reddish on the back; stamens declinate.

Notes.—Reported from East Africa: Wala River in meadows. R. Böhm 124. This species shows affinity with *C. scabrum*, Herb.

92. *C. FIMBRIATULUM*, Baker, Journ. Bot. 196 (1878); Baker, Amaryll. 1888, P. 90.

93. *C. CRASSIPES*, Baker, Gard. Chron. 126; (1887); Baker, Amaryll. 1888, pp. 90-91.

94. *C. VASSEI*, Boiss., Bull. Mus. d'Hist. Nat. Paris. 13:444-445. 1907.

Description.—Bulb ovoid, about 10 cm. in diameter, without a distinct neck, bulb scales bright brown; leaves about 12, those toward center of the leaf-rosette are much narrower, the outer ones are 50 to 60 cm. long and 5 cm. wide at the base, becoming gradually pointed toward the apex, light green, margins rough; scape originates laterally, reaching a length of 60 cm., considerably flattened, green, tinted with brown, glaucous; spathe not described; flowers slightly scented, 16 to the umbel, opening successively starting from the outside; perianth funnel-shaped, tube slightly curved, 10 to 12 cm. long, pink; segments linear-lanceolate, three outer narrow; All parts of perianth somewhat recurved at the tip; stamens and pistal curved toward one direction; filaments white with pink, a little shorter than the perianth; anthers linear, yellowish-brown, 5 mm. in length; style bright-red, reaching nearly the same length as the perianth segments; stigma capitate; ovary green.

Notes.—This species is native to Tropical Africa, especially Mozambique. Bois placed the plant between *C. crasipes*, Baker and *C. pedicellatum*, Pax. It differs from the first by its smaller leaves, shorter pedicels and curved perianth which is pink instead of greenish. It differs from *C. pedicellatum* by its more numerous flowers per umbel, and much shorter pedicels. The Musée d'Histoire Naturelle in Paris received in 1905 from Mr. Vasse from Portuguese East Africa.

95. *C. KIRKII*, Baker, Bot. Magaz. Plate 6512; Baker, Amaryll. 1888, p. 91.

96. *C. STAPFIANUM*, Kränzel, Bull. Misc. Inform. Kew. 191-192, 1913.

Description.—Bulbs globose, about 7.5 cm. in diameter, neck 5 to 6 cm. long, and 2.5 to 3 cm. thick; leaves have not been fully described; scape 20 to 30 cm. long, two-flowered; differs from most other species by its long-flower-stalk, 5.5 cm. in length; perigone white, nearly 12 cm. long, funnel-shaped, 3 to 5 cm. in diameter; tube relatively short; perigone segments divided a little above the lower third, gradually forming a relatively narrow funnel; stamens 3.5 to 5 cm. long; ovary short, ellipsoid or elongate-obovate 1.2 to 2 cm. long.

Notes.—This species is known from Brazil, mainly from Goyaz (Glaziou nr. 22, 204). Kränzel states that this species resembles at first sight *C. americanum*, L.

and *C. erubescens*, Ait. It also shows some resemblance to *C. podophyllum*, Baker, especially in the two-flowered scape.

97. *C. PODOPHYLLUM*, Baker, Bot. Magaz. Plate 6483; Baker, Amaryll. 1888, p. 91.

98. *C. RATTRAYII*, Hort., Gard. Chron. 38:11 with Supplem. illustr., 1905.

Description.—There is no complete morphological description of this species, although the illustration is very clear and excellent. The flowers are pure white and fragrant. The leaves are ascending, dark green. "Botanically it appears to be the most crenate of the *C. giganteum* section."

Notes.—For this plant Sir Trevor Lawrence Bart received a First Class Certificate at the Royal Horticultural Society in 1905. The plant was introduced by Major Rattray who sent the first bulbs from his garden at Eutelobe. It is stated that the plant is indigenous in the Victoria Nyanza district. "Later Major Rattray sent to the neighbourhood of Lake Albert, where it is said to be indigenous, and secured the bulbs which are now in cultivation." It has been claimed by the natives that when Mtera was King of Uganda, this species was dedicated to his use and to the highest chiefs of the country, and penalties were imposed on others who were found to possess this plant.

99. *C. GIGANTEUM*, Andr., Bot. Rep. Plate 169, Red. Lil. Plate 181; Bury Hexand. Plate 17; Baker, Amaryll. 1888, pp. 91-92; *C. petiolatum* var. *spectabile*, Herb. Amaryllidac. 260 (1837); *C. vanillodorum* Welw.; Baker in Journ. Bot. 196 (1878); Illustr. Hort. n. s. t. 617. *Amaryllis gigantea*, Ait. *A. latifolia*, Lam., *A. ornata*, Gawl. in Bot. Magaz. Plate 923. *A. candida*, Tratt. Tabb. Plate 488.

100. *C. BEQUAERTI*, De Willd., Plantae Bequartinae. Etudes sur les recoltes botanique du Dr. J. Bequart chargé de missions du Congo Belge. (1913-1915) 46-47, 1921.

Description.—Bulb unknown; leaves ensiforme, reaching a length of over 110 cm., and a width of 3 to 5 cm., the margins denticulate-ciliate; Peduncle thick, compressed, about 35 cm. long and 10 to 15 mm. thick; 5 to 6 flowers per umbel, white; spathe-valves oval, pointed, reaching a length of 10 cm. and a width of 5 cm. toward the base; perianth tube including the ovary, 18 to 22 cm. in length, slightly curved toward the top; segments oblong, 10 to 11.5 cm. and 4 to 5 cm., apiculate; filaments curved toward the center of the flower, about 10 cm. long; anthers 20 mm. long and 2 mm. wide; style as long as the stamens.

Notes.—This species is native to the Belgian Congo. The type specimen was taken near Malisawa (Lesse) on March 9th., 1914 by J. Bequart, nr. 3003. It may be related to *C. giganteum*.

101. *C. CONGOLENSIS*, De Willd., Mission Emile Laurent (1903-1904); Etat Independant Congo. 1:370-371, Plates CIX, CX, CXI, 1905-1907.

Description.—Bulb thick, subglobose, 9 cm. in diameter, leaves about 17, 75 cm. long, 6.5 cm wide, acute, deep green, gradually becoming narrow at the base, petiole somewhat gutter-shaped; scape robust; umbel 5 to 6 flowered; spathe valves oval, pointed; perianth tube stretched, longer than the free lobes, reaching a length of more than 10 cm., 5 cm. wide at base; flowers beautiful white; stamens as long as the style, much shorter than the perianth; anthers half-moon shaped, pollen yellow.

Notes.—Native to the Congo (Em. and M. Laurent), exact locality is not known. This species was found between a number of bulbs of *C. giganteum* and *C. Laurentii* to which it shows relationship.

102. *C. SUAVEOLENS*, A. Chevalier, Novitates Flor. Africanæ, Mem. Soc. Bot. France. 2:212-213, 1911 (1912).

Description.—Bulbs thick; leaves many, wide spreading to erect, often undulate; scape 50 to 70 cm. high, bearing at the top 2 to 5 sessile flowers, strongly scented; bractioles lanceolate, obtuse, green, nearly 7.5 cm. long, 2 cm. at the base; perianth tube greenish, 15 to nearly 18 cm. long, erect rather cernious, lobes white, ovate-oblong, attenuate on both sides, obtuse, suddenly apiculate, 8 to 10 cm. long, 3 to 5 cm. wide; anthers sickle shaped, 2 to 2.5 cm. in length.

Notes.—Common in open parts of virgin forests of the Ivory Coast, between Bingerville and Akandie nr. 20074 (type), and other places. This species is apparently related to *C. congolense*, De Willd, but may be a variety of *C. giganteum*, Andr. This species was first introduced to Horticulture by Mr. Joly.

103. *C. STENOPHYLLUM*, Baker, Warb. Kunene Sambesi Expedition 566, 1903.

Description.—Bulb ovoid, 1 poll in diameter, neck elongated; leaves 4 to 5, erect, linear, flaccid, 1 to 2 lin wide; margins smooth; peduncles 2 lin in diameter;

umbel two-flowered, sessile; spathe-valves lanceolate, 2 poll in length; perianth white; tube somewhat curved, 4 poll in length; segments of the limb oblong, 9 to 10 lin wide; base attenuate; stamens declinate; anthers linear, yellow, 4 lin long.

Notes.—Collected in Kubango at an elevation of 1100 meter. Her. nr. 406, 1899.

104. *C. POLYPHYLLUM*, Baker. Schinz, Beitrage zur Kenntniss der Afrikanische Flora Bull. Herb. Boiss. 3 II Ser. :667, 1903.

Description.—Bulb unknown; leaves 15 to 20, erect, linear, 8 to 10 poll. in length, 3 lin. wide, flaccid, glabrous; umbel 6-flowered, pedicels short; spathe-valves ovate, acuminate, 2 poll long; perianth tube suberect, 3 poll long; segments of the limb oblanceolate to oblong, tube 5 to 6 lin. wide, white back shaded with red; stamens declinate; anthers 3 lin long.

Notes.—Native to Southwest Africa; Hereroland, east of Windhoek (Seidlungsfarm) Dinter 826.

105. *C. LINEARE*, Linn. fil., Suppl. 195; Baker, Amaryll. 1888, p. 92; *C. revolutum* Herb. Amaryllidac. 267 (1837), *Amaryllis revoluta*, L'Herit.; Gawl. Bot. Magaz. Plate 915. *A. revoluta* var. *gracilior* Bot. Magaz. Plate 623. *Crinum algoense*, Herb.

106. *C. VARIABILE*, Herb., Amaryllidac. 268, Plate 44 fig. 23 (1837); Baker, Amaryll. 1888, p. 92; *Amaryllis variabilis*, Jacq. Hort. Schoen. 4:14 Plate 429. *A. revoluta* var. *robustior* Gawl. in Bot. Reg. Plate 615, *Crinum variabile* var. *roseum* Herb. in Bot. Reg. Plate 9. *C. crassifolium*, Herb. see Amaryllidac. 268 (1837).

107. *C. CAMPANULATUM*, Herb., Bot. Magaz. sub. Plate 2121: Baker, Amaryll. 1888, p. 92; *C. aquationum* Burchell; Bot. Magaz. Plate 2352. *C. caffrum*, Herb. Amaryllidac. 272 (1837), *Haemanthus hydrophilus*, Thunb.

108. *C. IMBRICATUM*, Baker, Gard. Chron. 784 (1881); Baker, Amaryll. 1888, pp. 92-93.

109. *C. MOOREI*, Hook. fil., Bot. Magaz. Plate 6110; Garden. Chron. fig. 101, (1887); Baker, Amaryll. 1888, p. 93; *C. Makoyanum*, Carriere in Rev. Hort. 417 (1877), *C. Colensoi*, *C. Mackenii* and *C. natalense*, Hort.

110. *C. FORBESIANUM*, Herb., Amaryllidac. 267 (1837); Baker in Bot. Magaz. Plate 6545; Baker, Amaryll. 1888, p. 93; *Amaryllis Forbesii*, Lindl.

Notes.—Schinz in Bull. Herb. Boiss. IV App. III, 47, 1896 states that a drawing of this species by his friend Dr. Fleck and an incomplete specimen agree with the description of Baker and the illustration of the plant in Bot. Magaz. Plate 6545. The leaves in the Dr. Fleck drawings are somewhat toothed, whereas according to the description of Baker they are conspicuously ciliated.

111. *C. BULBISPERMUM*, (Burm.), Milne-Redhead & Schweickerdt, Jour. Linn. Soc. Bot. LII:159-162. 1939; *Amaryllis bulbisperma*. Burm. Prodr. Cap. p. 9, 1768; *Crinum capense* var. *riparia*, Herb. Bot. Mag. t. 2688. 1826; Baker, Amaryll. 1888, p. 93-94.

Notes.—This is the species that is listed as *Crinum longifolium*, Thun. Prodr. 39, in Baker's Amaryllideae, 1888, on pages 93-94. See the reference to Milne-Redhead & Schweickerdt cited above for full explanation.

112. *C. MACOWANI*, Baker, Gard. Chron. 298 (1878); Bot. Magaz. Plate 6381; Baker, Amaryll. 1888, p. 94.

113. *C. SUBMERSUM*, Herb., Bot. Magaz. Plate 2463; Baker, Amaryll. 1888, p. 94.

114. *C. LONGIFLORUM*, Herb., Amaryllidac. 271 (1837); Baker, Amaryll. 1888, p. 94; *Amaryllis longifolia* var. *longiflora*, Ker. in Bot. Reg. plate 303.

115. *C. VIRGINEUM*, Mart., Roem. et Schultes. Syst. Veg. 7:855; Baker, Amaryll. 1888, pp. 94-95; *C. petiolatum* var. *virgineum*, Herb. Amaryllidac. 261 (1837).

UNCLASSIFIED.

116. *C. ESQUIROLI*, Lévl., Mem. Pontifica Acad. Romana dei Nuovi Lincei 24:343, 1906.

Description.—Bulb unknown; stem 45 to nearly 90 cm. in length; leaves narrow, 12 mm. wide; 7 to 12 flowers per inflorescence; ovary sessile; tube 10 cm. long, limb about 7.5 cm. long; perianth segments lanceolate, 1.2 cm. wide, acuminate; stamens inclus; style slender, 10 to 12 cm. long; stigma minute.

Notes.—Reported from Kouy-Tcheou, China (18 June, 1904 no. 134 Jos. Esquirol) *C. Esquirol* is a peculiar species, having sessile ovaries, inclus stamens and narrow leaves. According to the collector Mr. Jos. Esquirol this plant is used by the natives as a remedy in case of sprains.

117. *C. ACAULE*, Baker. Thiselton-Dyer Flora. Capensis. 6:532, 1896-97.

Description.—Bulb unknown; leaves linear, 45 cm. long and 1.2 cm. wide, more or less firm, glossy; stem one-flowered; spathe-valves linear, green; perianth-tube cylindrical erect, 5 cm. long; segments lanceolate, erect and recurved at the end, double the length of the tube, 1.2 to 2 cm. wide at the middle, keeled with pale red; stamens half the length of the segments; anthers linear-oblong, reaching a length of 0.6 to 8.5 cm.; style as long as the perianth.

Notes.—Native to Zululand; Sambaans Territory. Collected in 1896 by Charles Saunders. This species was cultivated in the collector's garden and a drawing of the plant was sent by Mrs. Saunders to the Royal Botanical Garden at Kew.

118. *C. VOYRONI*, Jumelle, Revue Horticole 19:205, 1924.

Description.—Bulbs 10 to 12 cm. in diameter; somewhat spherical, though elongated toward neck; neck about 4 cm. long; leaves about 12, somewhat coriaceous, exterior ones 50 cm. long; scape flattened, about 40 cm. long, 2 cm. thick; inflorescence 20 flowered; flowers with agreeable odor, almost sessile; perianth tube greenish, about 20 cm. long, 4 mm. in diameter; perianth lobes white, somewhat reflected during anthesis, about 9 cm. long; stamens slightly shorter than perianth lobes, 6 cm. long, bearing yellow anthers; style red, 8 cm. long.

Notes.—Native to Madagascar; flowered in the Jardin Botanique of Marseille, from bulbs sent by Mr. Voyron.

119. *C. RAUTANENIANUM*, Schinz, Th. Durand et Hans Schinz, Conspectus Florae Africanae. Vol. V : 250, 1895.

Notes.—No description has apparently been given of this plant. Schinz records "Afr. auto-occ. : pays des Orambo, Schinz 822." This species is apparently related to *C. Lugardae*, N. E. Brown, from which it differs by its larger flowers and bulbs.

120. *C. LUGARDAE*, N. E. Brown, Gard. Chron. 34:49, 1903.

Description.—Bulbs ovoid, 4 to 5 cm. in diameter, neck well developed, about 5 to 7 cm. long; leaves linear, deep green, 45 to 75 cm. long 1.2 to 1.8 cm. wide, acute and concave, finely scabrous along the margins, not glaucous; scape erect, 10 to 30 cm. long, somewhat compressed, carrying two to six flowers; valve-bracts 3 to 7 cm. long, outer one 1.2 to 1.8 cm. long, oblong-lanceolate, acute, margins rolled inward; inner bract linear, to linear-filiform; pedicels almost wanting to about 1.2 cm. in length; ovary ellipsoid, 0.8 to 1.2 cm. in length; perianth tube slender, cylindrical, 8 to 10 cm. long, and after Brown, "curved gradually, [or according to the drawing, curved abruptly] passing into the funnel-shaped limb, green"; segments lanceolate, 7 to 9 cm. long, 15 to 25 cm. wide, reovate at the apex, white with a light pink median stripe, point green.

Notes.—Native to the Kwebe Hills near Lake Ngami located in the dry interior part of South Africa. This *Crinum* is characterized by its small bulbs, whereas the leaves are conspicuously long and narrow. Mrs. E. J. Lugard discovered this species, and sent a bulb to the Royal Botanic Gardens, Kew. N. E. Brown based his description in part on a colored drawing of this species made by T. Bames at Koobies which is also in the neighbourhood of Lake Ngami. This species is apparently related to *C. Rautananianum*, Schinz., from which it differs by its smaller flowers and bulbs.

121. *C. CRISPUM*, Phillips, Flowering Plants of South Africa. 14 : Plate 532, 1934.

Description.—Bulbs 5 to 6 cm. in diameter, Neck 5 to nearly 15 cm. long; leaves about 20, 8 to almost 22 cm. long, 4 to 5.5 cm. wide, linear, glabrous, margins undulate; scape 5.5 to 8 cm. long, 0.5 to 1.2 cm. thick, compressed; spathe valves ovate, acuminate to 6 cm. long; umbel 5 to 6 flowered, perianth tube 8 to 9 cm. long, cylindrical; segments 5 cm. long, sub-acuminate; Color of the flowers almost pure white to pink toward back of segments; ovary ellipsoid, becoming somewhat globose when older; filaments filiform, anthers curved; stigma obscurely trilobed.

Notes.—Native to Transvaal, Waterberg Distr., farm "Groote Vlei" near Naboomspruit, where it grows on low, brackish situations. Galpin nr. 11678. Pretoria Distr. Zee Kolgat, near Piernaar's River. Vogts in Nat. Herb. nr. 14509, farm "Roodeplaat", near Piernaar's River. Letty in Nat. Herb. nr. 15877 (type specimen). The plant is said to be abundant in above mentioned places. The species was first collected by E. E. Galpin in 1931, and was collected the following year near Pretoria by L. R. Vogts.

122. *C. GIGAS*, Nakai, Plantae Japonicae et Koreanae. Botanical Magazine (Tokyo) 44:515-516, 1930.

Description.—Bulb round, 15 to 30 cm. in length, neck 100 to 150 cm. high and 10 to 30 cm. wide; leaves falcate, bright green, 20 to 30 cm. wide, 150 to 200 cm. long, acute, margins undulate; scape 100 to 150 cm. long, robust, compressed, 2 to 3.5 cm. thick; bracts elongated, boat-shaped, greenish 10 to 12 cm. long, 4 to 5 cm. wide; bractioles 5 to 6.5 cm. long, 2 to 4 cm. wide; flowers sweet-scented, 30 to 40 per inflorescence; peduncle erect, 2.5 to 3 cm. long; ovary about 1.2 cm. long, bright green; perigone white, tube about 8 to 9 cm. in length; limbs subulate, 6 to 10 cm. long; stamens erect; style reddish-purple, shorter than the stamens.

Notes.—Native to the forest of Koromodate near Kitamura on the islands of Hahajima and Mukozima.

123. *C. ELEONORAE*, Blaetter et McCann, Journ. Bombay Nat. Hist. Soc. 32: 733-734, 1928.

Description.—Bulb ovoid to almost spherical, 15 by 13 cm.; neck narrow and stout, 8 cm. long, surrounded by old pale leaf-remnants; leaves appear after flowering; leaves ensiform, apex obtuse, 60 cm. long, 5 cm. wide, not very firm, relatively thin, glabrous, deep green, margins entire; scape appears laterally, 50 cm. long, 2.5 cm. in diameter, cylindric, somewhat compressed, green tinged here and there with purple; flowers nodding, strongly scented, white; about 20 flowers per inflorescence; spathe-valves broadly lanceolate, acute or obtuse 8 cm. long and 3 cm. wide, green, with some purple on outside; Bractioles linear, about 8 cm. long, of same color as spathe-valves; pedicels stout 0.6 to 1.2 cm. long, Perigone white, sometimes tinged with purple in center of back, funnel-shaped; tube 3 cm. long, cylindric toward base; segments to 7.5 cm. long, 2 cm. wide, lanceolate, those of inner cycle not seldom oblanceolate, reflexed, somewhat concave toward apex; filaments on the throat of perigone-tube, purple; style filiform, 5 cm. long, white below, red in upper part.

Notes.—This species has been reported from Lingmala near Mahableshtar, where it was found along the open-hills on both sides of the river above Yenna Falls, also half-way between Panchgami and Mahableshtar (McCann nrs. 7, 8, 9, 10 type).

124. *C. GLAUCUM*, A. Chevalier, Mem. Soc. Bot. Frabee. 2:212, 1911 (1912).

Description.—Bulbs 20 cm. long, 15 cm. in diameter, ovoid; leaves 12 to 15, erect, margins undulate, 90 to 100 cm. in length, and 10 to 12 cm. wide, lanceolate to linear, narrow caniculate in the upper part, glaucous; scape firm, compressed, 60 to 90 cm. long, 2.5 cm. wide, glaucous, erect; flowers 6 to 14 (usually 7 to 10) per umbel, with vanilla-like scent, white, sessile; Spathe 2 to 3 parted, ovate or lanceolate, obtuse imbricate, 10 to 12 cm. long; perianth tube green, somewhat curved at apex, 15 to 20 cm. long, 5 to 8 mm. in diameter; perianth lobes about 4 to 5 cm.; anthers curved, 20 to 25 mm. long; style almost as long as the stamens; fruits obovate, attenuate, about 12 to 15 cm. long.

Notes.—Reported from Lower-Dahomy, frequently in the region of Savé-Agouagon. Chevalier nr. 23581.

125. *C. SCILLIFOLIUM*, A. Chevalier, Mem. Soc. Bot. France. 2:211, 1911 (1912).

Description.—Plants stoloniferous; bulbs oblong, 10 cm. long; leaves many, linear, canaliculate, 50 cm. long, 12 to 15 cm. wide in the middle, margins not scabrous; scape compressed, 40 cm. high, 12 to 15 mm. thick, reddish green; flowers subsessile; umbel of three flowers; spathe-valves ovate, acuminate, 5 to 6 cm. long; perianth tube almost erect, subarcuate at top, greenish white, 15 to 17 cm. long; segments white, with reddish lines, 7 to almost 10 cm. long, nearly 4 cm. wide, ovate elliptic, acuminate; stamens shorter than the perianth; anthers arcuate, less than 1.2 cm. in length.

Notes.—Reported from the Ivory-Coast, along the banks of the Hana River near Fort Binger on periodically inundated lands. Aug. Chevalier nr. 19499. No relationship to other species is indicated.

126. *C. TOXICARUM*, A. Chevalier, Mem. Soc. Bot. France. 2:212, 1911 (1912).

Description.—Bulbs ovoid, 5 to 9 cm. in length; leaves 8 to 10, linear, firm, 40 to 60 cms. long, 3.5 to 4 cm. wide, subcaniculate, margins apparently scabrous; flowers two per umbel, sessile; spathe-valves lanceolate, 6.5 to 8 cm. long; perianth tube curved, 9 to 11 cm. long, 6 mm. wide, pale green; segments ovate-lanceolate, acuminate; perianth ovoid campanulate, whitish with red stripes, 18 cm. long, 3.5 to 4 cm. wide; filaments 0.6 cm. shorter than the perianth; anthers linear, less than 0.6 cm. long; style reddish-white.

Notes.—Native to Moyen-Chari near Neyalims village. Kom. nr. 8554. Has also been observed in Bongolo and Télé, in Kabas near Fort Archambault etc.

This species is considered poisonous by the natives, who use the plants sometimes in fetish-worship.

127. *C. STUHLMANNI*, Baker, Thiselton-Dyer, Flora of Tropical Africa. 7:378 London 1898.

Description.—Bulb and leaves have not been described; scape stout, 2 cm. in diameter; umbel dense, composed of many flowers; spathe valves large and thick; pedicels, 2.5 to 7 cm. in length; flowers erect; perianth tube slender, 7.5 cm. in length; limb 12 cm. long; segments oblanceolate, above 1.2 cm. wide; stamens as long as the segments.

Notes.—Native to the Mozambique Distr. East Africa; Dar-es-Salam. *Stuhlmann* nr. 8536 in Berlin Herbarium. No relationship to other species is indicated.

128. *C. MENYHARTHII*, Baker, Thiselton-Dyer, Flora of Tropical Africa. 7:395-396, London 1898.

Description.—Bulb described as larger than a man's head; leaves unknown; scape 2 cm. in diameter, less than 30 cm. in length; many flowers per umbel; spathe valves 10 cm. in length; pedicels erect, 3 to 4 cm. long; perianth tube straight or somewhat curved, 10 to 11 cm. in length; segments linear, ascending many-nerved, considerably tinged with red, half as long as the tube; filaments red, equally as long as the perianth segments.

Notes.—Native to the Mozambique Distr. British Central Africa; reported from the Zambesi River. *Menyharth* nr. 690. No relationship to other species has been indicated.

129. *C. TANGANYIKENSE*, Baker, Thiselton-Dyer, Flora of Tropical Africa. 7:400 London, 1898.

Description.—Bulb unknown; leaves ensiform, 45 cm. in length, 3 cm wide, broad toward the base, relatively firm, margins not ciliate or scabrous; scape slender; 2 to 4 flowers per umbel, sessile; spathe valves ovate-cuspidate, 5 cm. in length; perianth tube erect, 10 cm. in length; perianth segments oblong, as long as the tube, 2.5 cm. wide, with broad red keel down back; stamens shorter than perianth; limb style as long as segments.

Notes.—Native to the Mozambique Distr. East Africa, Uzige northern part of Lake Tanganyika. *Scott Elliott* nr. 8302. No relationship to other species has been indicated.

130. *C. ERYTHROPHYLLUM*, Carey. Bot. Mag. 47, t. 2121, p. 7; Herbert, Amaryll. 1837, p. 258; Hayward, Herbertia 7:92, 94, 1940.

Description.—Bulb small, 6 to 7.5 cm. in diam.; leaves sprawling, not over 30 cm. long, 2.5 to 5 cm. wide, curling, and narrowing to a point, wine colored; scape slender, about the size of a pencil, under 30 cm. long; umbel 3 to 4 flowered; perigone white, tepals, 7.5 to 10 cm. long, linear-lanceolate, much like *Crinum pratense* Herb.

Habitat.—Rangoon, Burmah.

Notes.—Herbert observes that "Dr. Carey lost this remarkable plant without having seen its flower, and vainly attempted to obtain it and *Macrocarpon* again. There is no doubt of its being a distinct species, but I cannot tell what are its affinities. Leaves as red as those of a red cabbage."

Mr. Wyndham Hayward of Winter Park, Florida obtained more than 100 bulbs of this species with a shipment of mixed *Crinum* bulbs from Hla Maung Bros., Rangoon, Burmah, in 1934. The brief description above is from that of Hayward cited above.

CHECK-LIST OF AMARYLLID COLOURED PLATES

Chiefly latter part 18th. and 1st. half 19th. Centuries

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Amaryllids were great favourites in English Gardens during the latter part of the 18th and the first half of the 19th century. During my researches for this Article, I came across a catalogue issued by the firm of Loddiges who had extensive nurseries near Hackney (now a part of London, but then well in the country) issued in 1823. This catalogue offered for sale as stove plants 13 species of *Amaryllis* (syn. *Hippeastrum*), 2 of *Lycoris*, 1 of *Zephyranthes*, 22 of *Crinum* in addition to 2 which I cannot determine, 4 of *Crinum* hybrids, 1 of *Boophone*, 1 of *Griffinia*, 3 of *Haemanthus*, 13 of *Hymenocallis* in addition to 1 which I cannot determine, and 1 of *Eurycles*. Further, as greenhouse plants 2 species of *Agapanthus*, 4 of *Nerine*, 1 of *Callicore*, 1 of *Zephyranthes*, 1 of *Amaryllis*, 2 of *Crinum*, 1 of *Vallota* and 1 of *Sprekelia*; in all 77 species. This list does not of course include the hardy species, but only those which were at that time usually grown under glass. No horticultural firm in Europe or in America has recently offered nearly as many species. If further evidence of the popularity of this order were necessary, it would be found in the number of plates and descriptive matter to be found in the botanical publications issued during this period. Practically all the plates in colour which are listed in this Article were drawn from living plants, grown by a large number of amateurs, botanic gardens and nurseries. These publications were in most cases edited by leading botanists of that time, and the plates were carefully and faithfully executed. The skill of the various botanical artists employed naturally varied considerably, but a large percentage of the plates are most beautifully finished and are real works of art. The great interest taken in horticulture during the early 19th century can also be realised by the fact that in 1827 no less than 10 serial publications, illustrating in colour plants cultivated in English Gardens, were being issued. It was a wonderful period for gardening, especially under glass, for the introduction to this country of new plants, and for publications relating to them.

Among these publications pride of place must be given to the *Botanical Magazine* which was first issued in 1787 and is still the leading botanical serial in the world, with an unbroken record, to the present date, of 155 years uninterrupted issue. At the time of writing this Article 9,633 plates have been issued, of which 270 represent Amaryllids. Its editors, beginning with its founder, William Curtis, comprise some of the most learned botanists of each generation—Thomas Curtis, Dr. John Sims, Sir William J. Hooker, Sir Joseph Hooker, Sir William Thiselton-Dyer, Sir David Prain, Dr. O. Stapf and Sir Arthur Hill, who died quite recently. The botanical artists, who were responsible for the plates, include such famous names as J. Sowerby, Sydenham Edwards, Rev. William Herbert (Dean Herbert), Sir W. J. Hooker,

W. H. Fitch, Miss M. Smith, and the present chief artist, Miss L. Snelling, whose work, in my opinion, compares most favourably with the best of the past periods.

At first the plates showed only the plant without any botanical detail, but some was given in vol. 46 (1819), and from then onwards an increasing amount of purely botanical information was included in the plates. Of late years this detail forms part of the text in order to allow the plants to be pictured alone and undisturbed by other drawings. An important "*Preliminary Treatise*" on the Amaryllidaceae by Dean Herbert consisting of 50 pages of text and 2 beautifully drawn and coloured plates, forms the beginning of Vol. 49 (1822). The Dean contributed very many descriptions and plates over a long period, mainly of Amaryllids and other bulbous plants, and his plates are among the finest of that period.

The first Amaryllid, described and pictured is *Narcissus Minor* in tab. 6 of the first volume, followed by tab. 46 of *Leucojum vernum*, and tab. 47 of *Sprekelia formosissima*. In the 16th volume two-thirds of the plates represent bulbous plants and half of the 17th to 26th volume is devoted to these subjects, which shows their popularity at that time. Later on their place was taken by orchids and the 65th volume (1839), although dedicated to Dean Herbert, contained only 1 Amaryllid!

The work issued in Nuremberg in 1750-1773, and of which the descriptions were written by Christopher Joseph Trew, is chronologically the first in the check-list which follows. This book, entitled *Plantae Selectae* is a folio with 100 plates, of which a few are of species of the Amaryllidaceae. The artist was George Dionysius Ehret, many of whose plates are particularly fine and who later came to England and worked there as a botanical artist.

Next in order of time came The *Botanist's Repository* issued in London by Henry Andrews from 1797 to 1814: this serial specialised in new and rare plants, and contains 664 plates, Andrews being responsible for both description and the illustrations. The size is quarto, and 10 volumes were issued. The author-artist had at least 4 other serials being issued contemporaneously, and is said to have been responsible altogether for over 1,500 plates on botanical subjects, beside the descriptions of the plants figured. It is therefore not surprising that the quality of the illustrations is not uniform.

Then followed what, to my mind, is the finest botanical publication ever issued—*Les Liliacées* by Pierre Joseph Redouté, Paris 1802-1816 in 8 volumes, 21½"x14", containing 486 magnificent plates, a great number of which are of Amaryllids. The edition was limited and all the illustrations were by Redouté, while the descriptions of the plants in the first 4 volumes were by A. P. de Candolle, in the 5th and 6th volumes by F. de la Roche, and in the 7th and 8th volumes by A. Raffeneau-Delile. The plants illustrated seem to stand out of the plate—the perspective is in my opinion better than that of the work of any other botanical artist—there are very few plates of Amaryllids which are not superlative in quality.

From 1806 to 1840 there appeared in London John Sibthorpe's famous and rare work *Florae Graeca* in 10 volumes folio with 966 plates, but this need not detain us, as only very few Amaryllids grow in Greece.

Leaving out a number of other serials in which Amaryllids are not pictured, we come to the *Botanical Register*, which from the point of view of this article, is next in importance to the *Botanical Magazine*. This serial comprises 33 volumes with 2,702 plates, of which 123 are of Amaryllids, and was issued in London from 1815 to 1847. The chief artists were Sydenham Edwards, Dr. John Lindley, and from 1831 onwards Miss Drake; the illustrations of the Amaryllidaceae reached a high degree of excellence and the plants described were mostly of recent introduction. One troublesome feature of this publication is that although the plates are numbered consecutively in the first series from the 1st to the 23rd volumes, the plates in the second series (24th to the 33rd volumes) are numbered separately in each volume—all references to the second series must therefore indicate both the year of publication and the number of the plate.

The first Editor was John Bellenden Ker, previously known as J. B. Gawler. It is under this first name (abbreviated as "Gawl.") that references to him will be found in the check-list which follows.

Although Dr. Lindley only assumed the Editorship of this serial in 1829, his initials, J. L., first appear at the foot of descriptions in vol. 9 (1823), and from then onwards he made himself responsible for most of the descriptive matter relating to the Amaryllidaceae, and later on for a number of beautifully executed plates.

While Sydenham Edwards was the chief artist of the *Botanical Magazine*, and before he left that publication to found and edit the *Botanical Register*, he was the artist of a *Dictionary of Gardening* and the Editor and artist of "*The New Botanic Garden*" also published under the title of "*The New Flora Britannica*." This was issued in 2 volumes Quarto in London in 1812 with 60 plates, but only 2 of these are of Amaryllids.

The next publication was Loddiges' *Botanical Cabinet* issued in London between 1818 and 1833, in 20 volumes with 2,000 plates; these are small in size but well executed, by various artists. A number of the Amaryllidaceae are represented, but there is no botanical detail and the descriptions are meagre. All the plants illustrated in this serial were grown and flowered in the nurseries of Messrs. Loddiges, and to that extent this is a unique publication: it was a great advertisement for the firm of Loddiges as well as a useful contribution to horticulture.

In the year 1819 there was published in Vienna Leopold Trattinick's *Thesaurus Botanicus*, a folio volume of 80 beautiful plates, the chief artist being Strenzel, who was responsible for 10 superb pictures of Amaryllids.

This was followed by the issue in London of *The British Flower Garden* by Robert Sweet, comprising 3 volumes of the 1st series and 4 volumes of the 2nd series, the whole containing 712 good plates by E. D. Smith. This work was issued between 1823 and 1838, and at the same time Sweet was issuing 4 other serials in which the Amaryllidaceae

were not dealt with; most of the plants illustrated by Sweet were grown in the nurseries by Messrs. Colvill of Chelsea, of which Sweet was for many years the Manager.

Then came one of the most beautiful plant books ever issued—Mrs. Bury's *A Selection of Hexandrian Plants*, a very large folio (24½"x18") of 51 plates, of which 45 represent Amaryllids, drawn by Mrs. Bury and engraved by R. Havell. This was published in London from 1831 to 1834 and is extremely rare. It is a magnificent work, and the plates are exquisitely drawn and coloured—the only publication apart from Herbert's *Amaryllidaceae* which deals almost entirely with plants of this order. Mrs. Bury lived in or near Liverpool and all her pictures are drawn from living plants.

Finally, in chronological order but ranking highly in merit and in botanical interest for readers of HERBERTIA, came *Amaryllidaceae* by the Hon. and Rev. William Herbert. This was issued in 1837 and contains 48 plates, small but extremely exact with much botanical detail, drawn by the author with meticulous care. This will always remain the classical text book of the student of this order of plants, even if many changes in nomenclature have been made in the century since it was published. Dean Herbert's skill as an artist is shown in the many plates he prepared for various botanical works, and his wide knowledge as a botanist is proved by the numerous new plants he described for the first time and named.

No plants illustrated in any other of any later work have been included in my list, but all plates of Amaryllidaceae in the *Botanical Magazine* up to and including vol. 162 (April 1940) have been mentioned.

In the check list which follows, I have adopted the classification and key of Dr. J. Hutchinson in the second volume of his *Families of Flowering Plants* (1934) with the changes in nomenclature since proposed by Traub (Herbertia 5:112-113, 1938) and by Traub and Uphof, Sealy and others. I have, however, not dealt with plants classified under the tribes "Alliaceae" and "Gilliesieae" as inclusion of the former would have made my list unduly long, while of the latter only a very small number of species were illustrated in the publications mentioned. The numbers represent the plates in the various works, and I have italicised those which appear to me to be of special merit; where a note of interrogation appears after a number it signifies a form or a variety, or a case in which the illustration has not been definitely determined, but is evidently very near the species under which it is placed.

The following abbreviations are used for the works referred to:

1	B M	Botanical Magazine
6	B R	Botanical Register
3	A B R	Andrews' Botanical Repository
8	B C	Loddiges' Botanical Cabinet
10	B F G	Sweet's British Flower Garden
5	F Gr	Sibthorpe's Florae Graeca

- | | | |
|----|-------|--|
| 4 | Red | Redouté's Les Liliacées |
| 11 | Bury | Mrs. Bury's Hexandrian Plants |
| 9 | Tratt | Leopold Trattinick's Thesaurus Botanicus |
| 7 | N B G | Sydenham Edwards' New Botanic Garden |
| 2 | P S | C. J. Trew's Plantae Selectae |
| 12 | Herb | The Hon. & Rev. William Herbert's Amaryllidaceae |

TRIBE AGAPANTHEAE

Genus AGAPANTHUS L'Herit.

- A. africanus* Beauv. BM 500; BR 699; BC 42
orientalis Leighton? BR 1843 t. 7; Red 6 & 403; NBG 3

Genus TULBAGHIA Linn.

- T. capensis* Baker BM 806
alliacea Sims
 var. *Ludwigiana* Harv. BM 3547
violacea Harv.? BM 3555

TRIBE IXIOLIRIEAE

Genus IXIOLIRION Fisch.

- I. montanum* Herb. BR 1844 t. 66; Red 241; Herb. t. 20 f. 2
 var. *tataricum* Herb. t. 19 & t. 20 f. 1

TRIBE GALANTHEAE

Genus GALANTHUS Linn.

- G. Elwesii* Hook. fil BM 6166
nivalis Linn. Red 200
plicatus MB BM 2162; BR 545; BC 1823
Ikariae Baker BM 9474

Genus LEUCOJUM Linn.

- L. aestivum* Linn. BM 1210; Red 135
pulchellum Salisb. BC 1478
vernum Linn. BM 46 & 1993;
trichophyllum Schousboe BM 9585; BR 544; Red 217; Herb t. 30 f. 4
autumnale Linn. BM 960; BC 812; Red 150 f. 2
roseum Martin Red 150 f. 1
hyemale DC BM 6711

Tribe CALLICOREAE Traub

Genus CRINUM Linn.

- C. asiaticum* Linn. BM 1073; BC 669; Red 348
 var. *declinatum* Herb. BM 2231; Bury 43
 var. *procerum* Carey BM 2684
 var. *anomalum* Herb. BM 2908
sumatranum Roxb. BR 1049
amabile Donn. BM 1605
defixum Gawl. BM 2208; BC 362
 var. *ensifolium* Roxb. BM 2301;
pusillum Herb. Herb. t. 32 f. 3
pedunculatum R. Br. BR 52; Red 408; Bury 11
bracteatum Willd. BR 179
mauritianum Lodd. BC 650

leucophyllum Baker BM 6783
cruentum Gawl. BR 171; BC 346; Bury 22
humile Herb. BM 2636
Balfourii Baker BM 6570
pratense var. *elegans* Carey BM 2592
angustifolium Roxb. BM 2355
 var. *confertum* Herb. BM 2522
 var. *Blandum* Roem. BM 2531
purpurascens Herb. BM 6525
Hildebrandtii Vatke BM 6709
augustum Roxb. BM 2397; BR 679; Bury 4
erubescens Ait. BM 1232; BC 31; Red 27; Bury 34 ?
americanum Linn. BM 1034; Red 332 ?
Commelyni Jacq. Red 322 ?
strictum Herb. BM 2635
zeylanicum Linn. BM 1171; Bury 29 ?; PS 13 ?
latifolium Linn. BR 1297; ABR 478?; BM 2217 ?; BM 2292?; BR 579?
brachynema Herb. BM 5937
flaccidum Herb. BM 2133; BR 426
Careyanum Herb. BM 2466
distichum Herb. BM 1253; Tratt. 39 ?
yuccaeflorum Salisb. BM 2121; ABR 390; BC 688; Red 62; Bury 21
Sanderianum Baker Bury 18
scabrum Herb. BM 2180; BC 529 ?; Bury 32
Kirkii Baker BM 6512;
podophyllum Baker BM 6483
giganteum Andr. BM 923; BM 5205 ?; ABR 169; Red 181; Bury 17
lineare Linn. fil. BM 915; BR 623
variabile Herb. BR 615; BR 1844 t. 9; BM 1178 ?
campanulatum Herb. BM 2352;
Moorei Hook. fil. BM 6113
Forbesianum Herb. BM 6545
bulbispermum (Burm.) Milne-Redhead et Schweickerdt BM 661; BR 546 ?; Red 347; Bury 42 ?;
 var. *riparium* Herb. BM 2688
Macowani Baker BM 6381
submersum Herb. BM 2463
longiflorum Herb. BR 303
rhodanthum Baker BM 7777/8
Schimperi Baker BM 7417
Woodrowi Baker BM 7597
Johnstoni Baker BM 7812
natans Hook. fil. BM 7862

HYBRIDS

Crinodonna Corsii Ragioneri BM 9162
erubescens X *capensis* BM 2336
pedunculatum X *zeylanicum* Bury 30

Genus AMMOCHARIS Herb.

A. falcata Herb. [= *Cybistetes longifolia* (Linn.) Milne-Redhead et Schweickerdt]
 BM 1443 (not fruit); BR 139;
 var. *pallida* BR 1219; BC 745 ?

Genus CALLICORE Link.

C. rosea Link. (*A. Belladonna* (Linn.) Ait) BM 733; Red 180; Bury 45; Tratt 40
 var. *pallida* BR 714; Red 479
 var. *blanda* Gawl. BM 1450

Genus *BRUNSVIGIA* Heist.

- B. Josephinae* Gawl. BM 2578 ?; BR 192/3; Red 370/2
grandiflora Lindl. BR 1335;
Slateriana Benth. BR 1842 t. 11; Herb. t. 32 f. 2
minor Lindl. BR 954; Herb. t. 32 f. 1
gigantea Heist. BM 1619
radulosa Herb. Herb. t. 22 f. 2

Genus *NERINE* Herb.

- N. sarniensis* Herb. BM 294; Red 33; Tratt 46
 var. *venusta* Herb. BM 1090
 var. *rosea* Herb. BM 2124
 var. *corusca* Herb. 1089 BM
curvifolia Herb. BM 725; Red 274
 var. *Fothergilli* Roem. ABR 163; Tratt 47
flexuosa Herb. BR 172
 var. *pulchella* Herb. BM 2407
pudica Hook. fil. BM 5901
filifolia Baker BM 6547
humilis Herb. BM 726; BC 1674?; Red 450
undulata Herb. BM 369; BC 1669?; Red 115
 var. *major* Tratt. Tratt 45
lucida Herb. BR 497
Bowdeni W. Watson BM 8117

HYBRID

- N. Mitchamiae* Herb. (*N. undulata* X *curvifolia*) BM vol. 49 p. 51; Herb. t. 45

TRIBE CYRTANTHEAE (Herb.) Traub

Genus *CHLIDANTHUS* Herb.

- C. fragrans* Herb. BR 640; Herb t. 27 f. 2

Genus *ANOIGANTHUS* Baker

- A. breviflorus* Baker BM 7072

Genus *CYRTANTHUS* Ait.

- C. obliquus* Ait. BM 1133; ABR 265; BC 947; Red 381
carneus Lindl. BR 1462
spiralis Burchell BR 167
collinus Burchell BR 162
pallidus Sims BM 2471; BC 1808 ?
odorus Gawl. BR 503
angustifolius Ait. BM 271; BC 368; Red 388
striatus Herb. BM 2534; BC 1945 ?
ochroleucus (Herb) Burch. Herb. t. 33 f. 14
Mackenii var. *Cooperi* Hook. BM 5374
clavatus (L'Herit.) Dyer BM 2291; BR 168
vittatus Desf. Red 182 ?
sanguineus Hook. BM 5218
Huttoni Baker BM 7488
parviflorus Baker BM 7653
rhododactylus Stapf BM 9175
epiphyticus J. M. Wood BM 9252

Genus *VALLOTA* Herb.

- V. purpurea* Herb. BM 1430; Bury 39
 var. *minor* Gawl. BR 552

TRIBE HAEMANTHEAE

Genus HESSEA Herb.

- H. crispa* Kunth. BM 1363
filifolia Benth. BR 440
gemmata Benth. BM 1620; Herb t. 29 f. 5

Genus CARPOLYZA Salisb.

- C. spiralis* Salisb. BM 1383; ABR 92; Herb. t. 29 f. 9

Genus BUPHANE Herb.

- B. disticha* Herb. BM 1217; BR 567
ciliaris Herb. BR 1153;
 var. *guttata* Herb. Herb. t. 22 f. 1

Genus GRIFFINIA Gawl.

- G. dryades* Roem. BM 5786
ornata Moore BM 6367
hyacinthina Herb. BR 163; Bury 14
intermedia Lindl. BR 990
parviflora Gawl. BR 511

Genus CLIVIA Lindl.

- C. nobilis* Lindl. BM 2856; BR 1182; BC 1906
Gardneri Hook. BM 4895
miniata Regel BM 4783

Genus HAEMANTHUS Linn.

- H. multiflorus* Martyn BM 961 & 1995; ABR 318; BC 912; Red 204 BM 3870 & 5881?
Mannii Baker BM 6364
Katherinae Baker BM 6778
cinnabarinus Decaisne BM 5314
puniceus Linn. BM 1315; BC 1948; Red 320; PS 44
magnificus Herb.
 var. *insignis* Hook BM 4745
natalensis Pappe BM 5378
carneus Gawl. BM 3373; BR 509; Herb t. 30 f. 3
 var. *strigosus* Herb. Herb t. 30 f. 2
albiflos Jacq. BM 1239; BR 984; BC 602; Red 398
 var. *pubescens* Herb. BR 382; BC 702
Baurii Baker BM 6875
deformis Hook. fil. BM 5903
rotundifolius Gawl. BM 1618
incarnatus Burch. BM 5532; Herb t. 31 f. 1
undulatus Herb. Herb t. 30 f. 1
concolor Burch. Herb t. 31 f. 2
coccineus Linn. BM 1075; BC 240; Red 39
 var. *coarctatus* Jacq. BR 181; Herb t. 31 f. 6
crassipes Jacq. Herb t. 31 f. 10
tigrinus Jacq. BM 1705
pubescens Linn. fil. BM 1523
Lynesii Stapf BM 8975
Nelsonii Baker BM 9293

Genus CHOANANTHUS Rendle

- C. cyrtanthiflorus* Rendle BM 9385

TRIBE ZEPHYRANTHEAE Herb.

Genus ZEPHYRANTHES Herb.

- Z. atamasco* Herb. BM 239; BC 1899; Red 31; Tratt 37;
grandiflora Herb. BM 2594; BR 902; Bury 13; BFG ser 2 t. 4
tubispatha Herb. BM 1586; Bury 25
mesochloa Herb. BR 1361
rosea Lindl. BM 2537; BR 821; Bury 13
Commersoniana Herb. Red 454; Herb t. 29 f. 3
Lindleyana Herb. Herb. t. 35 f. 5 (flower only)
gracilis Herb. Herb. t. 29 f. 1
minima Herb. Herb t. 24 f. 3
verecunda Herb. BM 2583 & 2593; Herb t. 29 f. 2
candida Herb. BM 2607; BR 724; BC 1419; Bury 25
citrina Baker BM 6605
concolor Lindl. BR 1845 t. 54

HYBRID: *Z. tubispatha* X *grandiflora*

- Z. Spofforthiana* Herb BR 1746

Genus PYROLIRION Herb. (Sealy)

- P. aureum* (R. & P) Herb. Herb t. 23 f. 2 & t. 29 f. 4
flavum Herb. BR 1724 ? (may also be *P. aureum*)

Genus COOPERIA Herb.

- C. Drummondii* Herb. BR 1835; Herb t. 24 f. 5
 var. *chlorosolen* Herb. BM 3482
pedunculata Herb. BM 3727; Herb t. 42 f. 3; BFG ser 2 t. 328

Genus HAYLOCKIA Herb.

- H. pusilla* Herb. BM 7693; BR 1371

Genus STERBERGIA W. & K.

- S. colchiciflora* W. & K. BR 2008; F Gr 311;
lutea Roem. & Schult. BM 290; Red 148; F Gr 310
Fischeriana Roem. BM 7441; Herb t. 47 f. 3
macrantha J. Gay BM 7459

Genus GETHYLLIS Linn.

- G. spiralis* Linn. fil BM 1088
afra Linn. BR 1016
undulata Herb. Herb 25 f. 5

TRIBE AMARYLLISEAE Traub

Genus AMARYLLIS (Linn. ex parte) Uphof Syn. Hippeastrum

- A. Bagnoldii* (Herb) T. & U. BR 1396;
 var. *Gillesiana* (Herb) Herb. t. 23 f. 1
bifida (Herb) T. & U. BM 2597; BR 1638?; BR 1148?; BM 2639?
advena Gawl. BM 1125; BR 849; BC 779?; BFG ser 2 t. 213?
pulchra (Herb) T. & U. Herb. t. 26 f. 1
rosea (Herb) T. & U. BC 1771; BFG ser 2 t. 107
chilensis R. & P. BC 1760?
pratensis (Herb) T. & U. BR 1842 t. 35; BM 3961?
Herbertiana (Lindl). T. & U. BR 1341
Elwesii (C. W. Wright) T. & U. BM 8614
fulgens (Hook. fil) T. & U. BM 5563

- bicolor* R. & P. BM 2399; BR 809; BR 1943; BC 1769?; BFG ser 2 t. 121?;
 Herb. t. 24 f. 12 & 15; Herb. t. 25 f. 1?
 var. *glauca* (Herb) BM 2687; BC 1746
phycelloides (Herb) T. & U. BR 1417;
solandriiflora (Herb) T. & U. BM 2573 & 3771; BC 1200; Bury 7 ?
candida (Stapf) T. & U. BM 9184
breviflora (Herb) T. & U. BM 3549
vittata Ait. BM 129; Red 10; Bury 40; Tratt 38
Harrisonii Lindl. BM 7737; BR 988?; Bury 27
rutila Gawl. BR 23; ABR 358?; BC 1449;
 var. *fulgida* (Herb) BM 1943 & 2475; BR 226; Bury 26 & 35
 var. *crocata* (Herb) BR 38; BC 1082 ?; Bury 16
 var. *acuminata* (Roem) BM 2273; BR 534 & 1188; BC 484; Bury 44
Blumenavia (Koch et Bouche) (Sealy) T. & U. BM 5666 & 9504
reticulata L'Herit. BM 657; ABR 179; Red 424; Tratt 41
 var. *striatifolia* (Herb) BM 2113; BR 352; Bury 48
procera Duchartre BM 5883;
belladonna Linn. BM 305 & 2315; Red 32; BR 234; Bury 41
reginae Linn. BM 453; Red 9; Bury 24; Tratt 42
stylosa Bury BM 2278; BR 719; Bury 33
miniata R. & P. Herb. t. 47 f. 7
calyptrata Gawl. BR 164; BC 864
psittacina Gawl. BR 199; BC 1204; Bury 23
organensis (Hook) T. & U. BM 2983; Bury 9 & 15?
aulica Gawl. BM 3311; BR 444 & 1038; Bury 19
pardina Hook fil. BM 5645;
cybister (Herb) T. & U. BM 3872; BR 1840 t. 33 (? Bentham)

HYBRIDS

- X *Johnsoni* Bury 1
 X *braziliensis* Red. 469
 X *spectabile* BC 159
 X *superba* (Vittata) Bury 31
 X *psittacina* BM 3528
 X *picta* BR 876; Bury 5
 X *Johnsoni* & *solandriiflora* Bury 46
 X *Splendens* (*rutila*-*belladonna*-*vittata*) Herb. BM page 52 vol. 49
 X *ambigua* (*solandriiflora* X *vittata*) Herb. BM 3542

Genus *PLACEA* Miers

- P. ornata* Miers BR 1841 t. 50

Genus *SPREKELIA* Heist.

- S. formosissima* Herb. BM 47; BFG ser 2 t. 144; Red 5; Bury 6; Tratt 44
 var. *glauca* Lindl. BR 1841 t. 16

Genus *LYCORIS* Herb

- L. aurea* Herb BM 409; BR 611; BC 847?; Red 61; Bury 3
squamigera Mamix. BM 7547
radiata Herb BR 596; ABR 95; Tratt 48

Genus *HABRANTHUS* Herb (Sealy)

- H. Andersoni* Herb ex Lindl BR 1345; BC 1677; BFG ser 2 t. 70;
texana (Herb) BM 3596; Herb. pl 24 f. 4
brachyandrus (Baker) Sealy BM 7344
cardinalis (C. H. Wright) Sealy BM 8553
gracilifolius Herb. BM 2464
 var. *Boothianus* Herb. BR 1967

robustus Herb. BM 9126; BC 1761; BFG ser 2 t. 14
versicolor Herb. BM 2485

Genus *VAGARIA* Herb.

V. parviflora Herb. BM 9406; Red 471;

TRIBE NARCISSEAE

Genus *NARCISSUS* Linn.

TRUMPET SPECIES

N. hispanicus Gouan

var. *maximum* Pugsley BM 51

moschatus Linn. BM 1300; Red 188; BFG ser 2 t. 101

pseudo-narcissus Linn. Red 158; Herb t. 43 f. 3

bicolor Linn. BM 1187

pumilus Salisb. BM 6; BFG ser 2 t. 143

minor Linn. Red 480; Herb t. 41 f. 28

asturiensis Jord. BM 9495; Herb t. 43 f. 4/5

TRUMPET HYBRIDS & GARDEN FORMS

N. "Henry Irving" BFG ser 2 t. 286

propinquus Salisb. BM 1301 upper

obvallaris Salisb. BM 1301 lower

albescens Pugsley BFG ser 2 t. 145

tortuosus Haw. BM 924

incomparabilis Miller BM 121; Red 220

Macleayi Lindl. BM 2588; BR 987

Sabinii Lindl. BR 762

N. triandrus Linn. BM 48 & 6473a

var. *pulchellus* BM 1262; BFG ser 2 t. 99

calathinus DC Red 177 & 410

TRIANDRUS HYBRID

N. Johnstonii Baker BM 7012

N. cyclamineus DC BM 6950

JONQUIL GROUP

N. Watieri Maire BM 9443

juncifolius Requier BR 1847 t. 22 f. 1; Herb t. 43 f. 1

rupicola Dufour BM 6473 c

minutiflorus Willk. Herb. t. 39 f. 22 & t. 43 f. 2

Jonquilla Linn. BM 15; Red 159

odorus Linn. BM 934; Red 157

var. *minor* BM 78; Red 428

JONQUIL HYBRIDS & GARDEN FORMS

N. trilobus Gawl. BM 945

bifrons Gawl. BM 1186 & 1299; Red 459

laetus Salisb. Red 427—2nd plate (see footnote)

gracilis Sabine BR 816; Red 427; BFG ser 2 t. 136

tenuior Curtis BM 379

Note:—My copy of *Les Liliacées* (Redouté) contains two plates numbered 427, as far as I know this is very rare. The second plate shows a fine hybrid under the name of "*N. laetus*," somewhat similar to t. 1299 in BM of *N. bifrons*. It is a cross between *N. Jonquilla* and an unknown large flowering species and is not represented in cultivation now.

TAZETTA GROUP

- N. Tazetta* Linn. FGr 358
corcyrensis Herb. t. 37 f. 1
papyraceus Gawl.
 var. *grandiflorus* BM 947
Broussonetii Lagasca BM 7016
pachybolbus Durieu BM 6825
dubius Gouan Red 429 & 409?
italicus Gawl. BM 1188

TAZETTA HYBRIDS & GARDEN FORMS

- N. Trewianus* Gawl. BM 940; BFG ser t. 118 & 179
Cypri Haw. BFG ser 2 t. 92
cupularis Salisb. (Soleil d'or) BM 925; Red 17; BFG ser 2 t. 191
orientalis Gawl. BM 946, 948, 1298
 var. *flore pleno* BM 1011
multiflora Haw. BM 1026
biflorus Curtis BM 197; Red 405
- N. poeticus* Linn.
 var. *recurvus* BFG ser 2 t. 188; Herb t. 40 f. 1
 var. *radiiflorus* Salisb. BM 193; Herb. t. 37 f. 2 & t. 40 f. 2
 var. *stellaris* Haw. BFG ser 2 t. 132
 var. *exertus* Pugsley Red 160
- N. viridiflorus* Schousboe BM 1687
serotinus Linn
 var. *deficiens* Herb. BR 1847 t. 22 f. 1
elegans Spach
 var. *obsoleta* Haw. BR 1847 t. 22 f. 2
bulbocodium Linn.
 var. *serotinus* Haw. BM 88; BFG ser 2 t. 164
 var. *conspicuus* Haw. Red 24; BFG ser 2 t. 326
 var. *tenuifolius* Salisb. Red 486; BFG ser 1 t. 114
 var. *citrinus* Baker BM 6473 b
 var. *monophyllus* Durieu BM 5831

(I am greatly indebted to my friend Mr. E. A. Bowles FLS, author of "A Handbook of Narcissus" the most recent and authoritative description of the Genus, for his help and advice in the compilation of the above list.)

Genus TAPEINANTHUS Herb.

- T. humilis* Herb. BR 1847 t. 22 f. 4

TRIBE EUSTEPHIEAE

Genus URCEOLINA Reich.

- U. pendula* Herb. BM 5464
 var. *fulva* Herb. Herb t. 26 f. 5
latifolia Benth. BM 4952
miniata Benth. BR 1839 t. 68

Genus EUSTEPHIA Cav.

- E. pamiana* Stapf BM 9164

Genus CALLIPSYCHE Herb.

- C. eucrosioides* Herb. BR 1845 t. 45
aurantiaca Baker BM 6841

Genus *EUCROSIA* Gawl.

E. bicolor Gawl. BR 207; BM 2490

Genus *PHAEDRANASSA* Herb.

P. chloracea Herb. BM 5361?; BR 1845 t. 17

Carmioli Baker BM 8356? (does not represent the true plant which will shortly be figured in BM.)

Bi-generic hybrid

Urceocharis edentata BM 8359—hybrid between *Urceolina pendula* & *Eucharis grandiflora*.

TRIBE EUCHARIDEAE

Genus *STENOMESSON* Herb.

S. aurantiacum Herb. BR 1844 t. 42

croceum Herb. BM 3615 ?; Red 187; Herb t. 28 f. 4

flavum Herb. BM 2641; BR 778; Herb t. 28 f. 1

var. *latifolium* Herb. BM 3803; BR 1843 t. 2

var. *curvidentatum* Herb. BM 2640; Herb t. 28 f. 2/3

humile Baker BR 1842 t. 46

coccineum Herb. BM 3865; Herb t. 28 f. 5/6

var. *breviflorum* Herb. Herb t. 28 f. 7

incarnatum Baker BM 3221 ? & 3867 ? & 5686 ?; BR 1497 & 1842 t. 66 ? BFG ser 2 t. 17

luteoviride Baker BM 6508;

viridiflorum Benth. BM 3866a

var. *angustifolium* Herb. BM 3866b;

Genus *PANCRATIUM* Linn.

P. illyricum Linn. BM 718; Red 153

zeylanicum Linn. BM 2538; BR 479;

maritimum Linn. BR 161 & 927 ?; F Gr 309; Red 8; NBG 41

canariense Gawl. BR 174

verecundum Ait. BR 413

longiflorum Roxb. Herb t. 42 f. 1/2

Genus *HYMENOCALLIS* Salisb.

H. tubiflora Salisb. BR 265;

speciosa Salisb. BM 1453; Red 156 ? & 412; Bury 47

ovata Roem. BM 1467; BR 43; BC 510 ? & 834 ?; Red 413 ?; Bury 28 ?

var. *glauca* Herb t. 35 f. 1

littoralis Salisb. BM 825?; 1879 ?; & 2621 ?; BR 940?; Red 154?; PS 27

pedalis Herb. BR 1641; BC 809

Harrisiana Herb. BM 6562;

Caribaea Herb. BM 826; BR 221?; BC 558 & 286?; Red 358? & 414; ABR 556

expansa Herb. BM 1941

macrostephana Baker BM 6436

lacera Salisb. BM 827; BC 19

var. *paludosa* Salisb. BM 1082?; BC 274?; Red 155

nutans Baker BM 1561

Macleana Nichols. BM 3675; BR 1841 t. 12; Herb t. 35 f. 2 ?

calathina Nichols. BM 2685; BR 215; Red 353; Bury 10

Amancaes Nichols. BM 1224; BR 600; BC 1266; Bury 37

schizostephana Worsley BM 7762

HYBRID

H. X Amancaes & *calathina* BR 1665

Note: This genus is much confused, and needs complete revision.

Genus PAMIANTHE Stapf.

P. peruviana Stapf BM 9315

Genus LEPTOCHITON Sealy

L. quitoensis (Herb) Sealy BM 6397; & 9491

Genus ELISENA Herb.

E. longipetala Herb. BM 3873

Genus CALLIPHRURIA Herb.

C. Hartwegiana Herb. BM 6259

Genus EUCHARIS Planch.

E. grandiflora Planch. BM 4971

Mastersii Baker BM 6831

Sanderi Baker BM 6676

subedentata Benth. BM 6289

Bakeriana N. E. Br. BM 7144

Genus EURYCLES Salisb.

E. sylvestris Salisb. BM 1419; BR 715; Red 384; Bury 20; PS 28

Cunninghami Ait. BM 3399; BR 1506

Genus CALOSTEMMA R. Br.

C. purpureum R. Br. BM 2100; BR 422;

var. *carneum* Lindl. BR 1840t. 26

luteum Sims BM 2101; BR 421 & 1840 t. 19

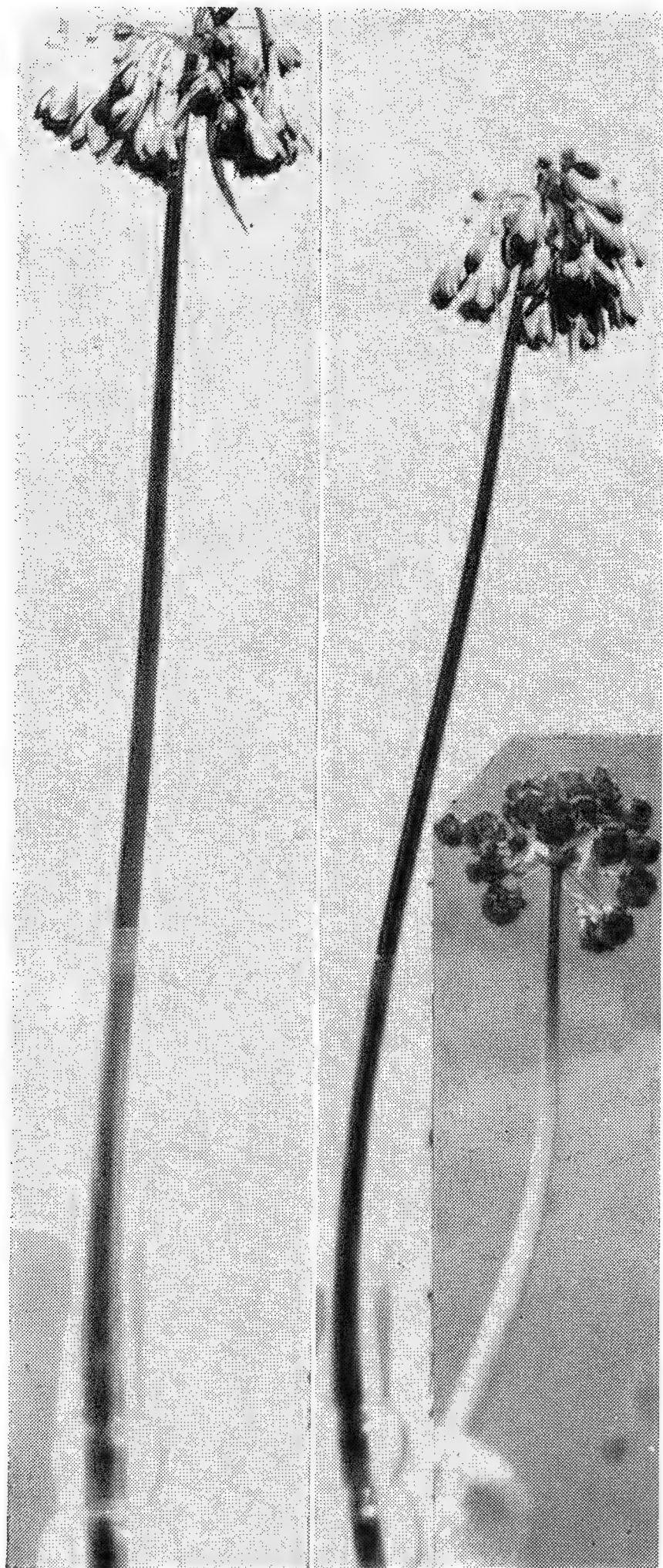


Fig. 73. *Calostemma purpurea*.
Photo by Mildred Orpet

CALOSTEMMA PURPUREA

MILDRED ORPET, *California*

Seeds of *Calostemma purpurea* were received from Mrs. James T. Gray, Orroroo, South Australia and planted in July 1936. The first flowers were produced in August 1942 as shown in Figure 73. The first one that flowered was sort of mauve in color, and a second a pale pink. They seem to flower with the new foliage coming—that is a thin, long leaf; the flower stem or peduncle is quite long, out of all proportion to the size of the flower.

The illustrations in Figure 73 show, *left*, photo taken head on, and *center*, taken with camera flat on its back looking up into the flower tubes to get the detail.

The cut flower was kept in water for ten days; the stem split at the base like dandelions when children split them for “curls”. The flowers dried and hung on while the seed pods developed—four large seed pods are shown at right in the Figure, and a number of incipient ones apparently will not develop.

From the standpoint of floriculture this may not be an outstanding subject, but from the viewpoint of science it is as important as any other amaryllid for it represents one of the few amaryllid species native to the Islands off the southwest coast of Asia and to Australia.

ABSTRACT: ARTICLE ON CALLICORE-BRUNSVIGIA HYBRIDS

L. S. HANNIBAL, *Concord, California*

The writer of an article in *Gardeners Chronicle* [*Amaryllis Blanda* And Its Allied Varieties And Hybrids, *Brunsdonna Ex Parte*. *Gardeners Chronicle*: Vol. 84, P. 349. (1928) With Fig of *Rubra Maj.*], who chose to remain anonymous, stated that Dean Herbert considered the genus which we now know as *Callicore** as not monotypic, and that it included some species of *Brunsvigia* such as *B. Josephinae*. His opinion receives support from the fact that five or more hybridists have succeeded in crossing *Callicore* with *Brunsvigia* spp. (R. H. S. 1926, P. 65) and as these garden hybrid "Brunsdonnas" occur with such ease it is only logical that wild crosses have occurred in the natural habitat of these plants. It is apparent that collectors at times have gathered these hybrids, along with back crosses of these hybrids, both of which often resemble the original *Callicore blanda* (syn. *A. blanda*, Bot. Mag., t. 1450, 1812).

Blanda, being tender, disappeared during Herbert's time, but it often reappeared later as seedling segregates from several possible sources, one being mentioned in Paxton's Mag. 1882. A similar clone, *pseudo-blanda*, which received a R. H. S. Award of Merit September 11, 1928, can be traced to an original *Parkeri* hybrid distributed by Mrs. Arbuckle in 1889 (R. H. S. Journal (1926), P. 67). Various other forms of *Blanda* have been noted among bulbs imported from the Cape. In general the *Blanda* forms, as distinguished from the type of the Cape Belladonna, have wider, more substantial leaves and late flowering, tubular-shaped blossoms of very pale self color when they first expand, but on the third or fourth day the perianths become entirely pink.

An allied form, *Callicore rosea* var. *rubra*, (syn. *A. rubra major*, of J. E. Elwes, see plate in article cited above) was considered to be a similar hybrid by Wm. Watson. It is only partly deciduous and bears a pronounced pseudo-leaf-stem 6" to 8" long. Fortunately it is very free flowering and quite hardy. The blossoms, which are crimson with a yellow base, are long lasting, and recurved only slightly. A typical *Brunsvigia* characteristic is the elongation of the pedicels to 7" or 8" as the fruits set, which is not quite so characteristic of *Blanda*. Many of the seedling crosses resulting from either of these original hybrid forms are of unusual merit, being very large, robust plants that flower quite freely with umbels far superior to the type of the Cape Belladonna; however, a number of seedlings revert to the original type and can be considered of no special value.

* The nomenclature adopted by the American Amaryllis Society, and by Standardized Plant Names, 1941, is used in this article with synonyms given in parentheses. However, it should be noted that, as indicated in the following article, *Callicore rosea* Link may shortly be superceded by transferring it to the genus *Brunsvigia* where it apparently rightly belongs. As will be recalled *A. belladonna* Linn., was proven to be the former *Hippeastrum equestre* Aiton (Herbertia 5. P. 100, 1938). Apparently Linnaeus never saw the "Cape Belladonna Lily", although it was well known in Spain and Italy as "Lilio Vulgaris", etc. The superficial resemblance of the circular "Blanda" umbel to that of the "Equestrian Lily" could have been the vector that misled Linn., 2nd, and Herbert in adopting the wrong name for this Cape bulb.—L. S. H.

In reviewing this article two things are apparent: first the writer implies that he does not regard *Brunsdonna* hybrids as bigeneric without definitely stating it, and secondly, no mention is made of hybrid progeny reverting to the *Brunsvigia* type. From some personal experience with *Blanda* forms it is apparent that Cape Belladonna genes are dominant in many of their characteristics, and that typical *Brunsvigia* forms seldom occur. "Brunsdonnas" can usually be recognized by one or more of the following characteristics: tenderness to frost, pseudo-neck to bulb, lingulate leaves, tubular flowers, circular umbel, strong orange to yellow base or eye in the blossom's trumpet, or marked elongation of the pedicels as the fruit matures.

CALLICORE AND BRUNSVIGIA

L. S. HANNIBAL, *California*

Callicore rosea Link (*syn. Amaryllis belladonna* Herbert non Linn.) may prove to be a *Brunsvigia*. Apparently 95% of the hybrids (Brunsdonnas) with *B. Josephinae* Redoute (*B. Gigantea* Van Marum), or *B. gigantea* Heist (*B. orientalis* Linn. or *B. multiflora* Aiton) readily set seeds. Normally we would expect sterile bigeneric hybrids, such as the *Crinnodonna* F-1 crosses, but as the plants in question are not sterile it appears that they may belong to the same genus. If a new name is given it should apparently be *Brunsvigia rosea* (Lamarck) since Lamarck's description of *Amaryllis rosea* in the Dict. Enc. dr. Bot. of 1789 long predates Link's *Callicore rosea*, which is the same plant.

The work of Cowlshaw (HERBERTIA, Vol. 2, P. 46) on his *multiflora* hybrids and the interesting observations (See Abstract above) on *Parkeri* and *Blanda* forms (Gard. Chron. 84. 1928. P. 349) only tend to substantiate these views. Chromosome studies should help to clear up this problem if any doubt exists.

The present major distinction between *Callicore* and *Brunsvigia* is that the seeds in the case of the former are practically sessile, while in *Brunsvigia* they are stalked. However, in *Brunsvigia* X *Callicore* hybrids, as might be expected, quite a variation in length of placentae can be observed, even in a single ovary. Stalks up to 5 mm. in length are not unusual. In general, depending on the clones examined, those having the longer pedicles when the fruits ripen show less tendency for the seeds to be sessile, which suggests possibly that elongated placentae in *Brunsvigia* are associated with pronounced length of the pedicels. However, there are other factors involved. In hybrids between several *Callicore* strains, where no *Brunsvigia* genes are known to exist, the fruits develop as acutely triquetrus, turbinate capsules on long pedicles*, and the seeds instead of being few in number, are densely packed almost like Pomegranate seeds, with 75 or more to a capsule, and surprisingly enough some of the seeds in this crowded aggregation were definitely stalked. Also the length of the pedicel was distinctly correlated with

* The longer pedicels always appear on the red scape forms. Those on green scape forms are seldom more than 5 or 6" long.

the number of seeds in the capsule—few seeds, a short pedicel; many seeds, a pedicel 7" or 8" long with up to 20% of the seeds in some capsules being stalked as in *Brunsvigia*.

This observation may not prove that *Callicore* is a *Brunsvigia*, but it does indicate that previous classifications may be at fault. Incidental-



Fig 74. Flowers of *Hemerocallis altissima* sp. nov. Photo taken early forenoon Aug. 28, 1934; petals were fading and melting; note elongated perianth tube, trumpet-shaped flowers and slender branched bostryxes.

ly it does clear up a puzzling problem for breeders. A few years back the U. S. D. A. carried out some long period corn inbreeding experiments. The ears finally obtained had few grains of no apparent value, but if two weak inbred strains of corn were crossed, the resulting hybrids were some of the most productive ever obtained. This applies

[CALLICORE-BRUNSVIGIA—Continued on page 146.]

HEMEROCALLIS ALTISSIMA STOUT, SP. NOV.

The Tsu-kin-shan Daylily

A. B. STOUT

The designation of this new species is based on 104 individual plants that have been grown to maturity at the New York Botanical Garden. Nine of these were wild plants transplanted from Purple Mountain, near Nanking, China, and 40 were grown from seeds of wild plants that

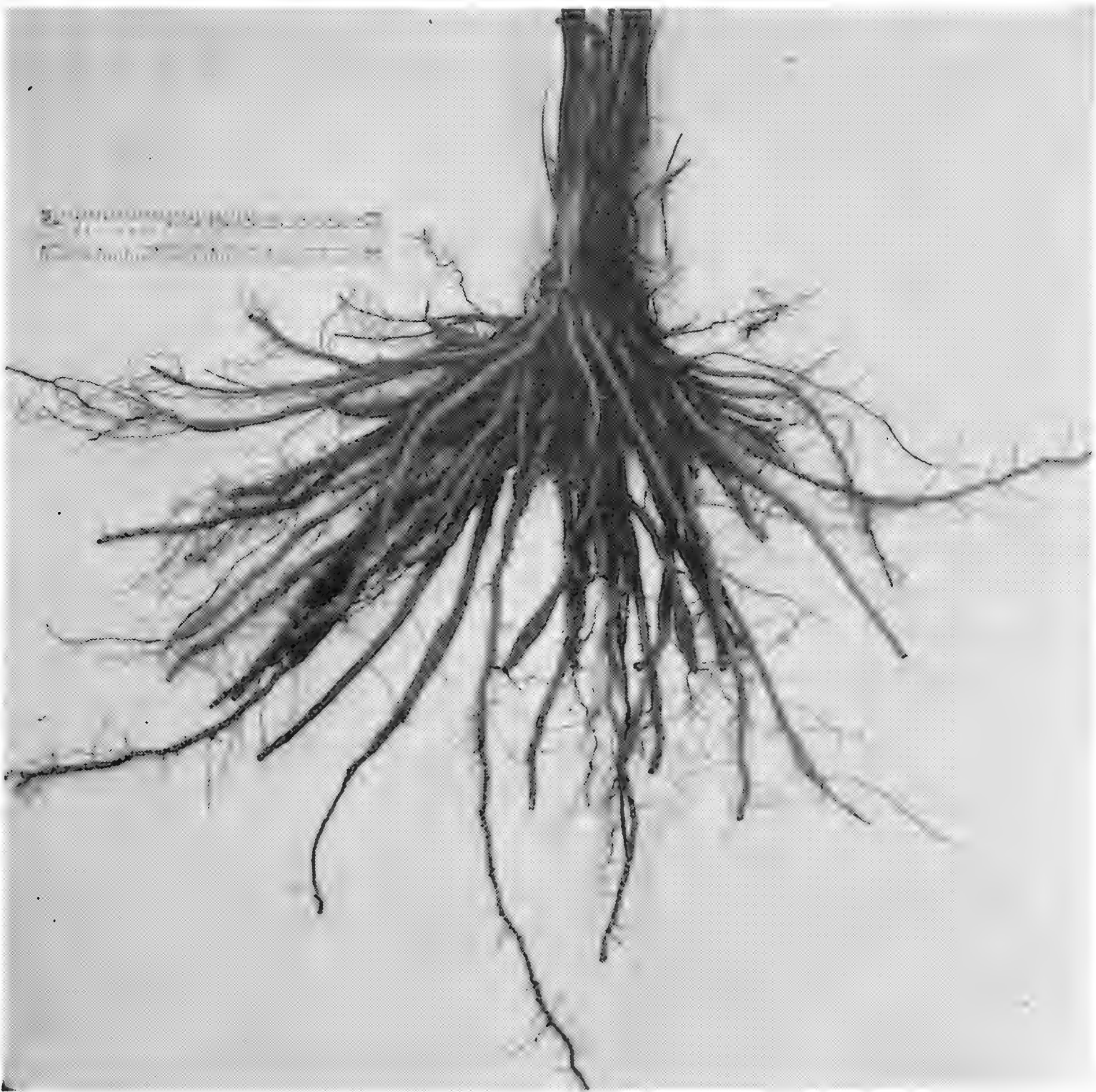


Fig 75. Roots, crown and base of leaves of *Hemerocallis altissima* sp. nov. Photo taken in November at end of growing season; most main roots are coarse cylindrical; some of enlarged roots are spindle-shaped and some have terminal enlargements.

grew on this mountain or near Chunchow about 50 miles from Nanking. These collections were made by Dr. Albert N. Steward. From seeds of controlled cross-pollinations involving two of the first plants from Purple Mountain, fifty-five seedlings have been grown to maturity. Of collections more recently made by Dr. Steward of seeds from "yellow-flowered daylilies that grew wild in the hills to the south and east of

Nanking'' a total of 189 plants are now being grown at The New York Botanical Garden and of these some have already flowered. All of these plants are very similar and sufficiently distinct from all other types of *Hemerocallis* known to the writer to warrant description as a new species.

A photograph of one of the first plants grown from seed that came from Purple Mountain is shown in plate 26 in the volume "Daylilies"¹. It may be considered that this plant is the type for the species *Hemerocallis altissima*² and that the others mentioned above are co-type plants. Herbarium specimens together with a series of photographs of the type and co-type plants are deposited in the herbarium of The New York Botanical Garden.

This species is herbaceous and perennial. Growth is discontinuous in autumn and plants are fully dormant during winter. The main roots are coarsely fibrous, and some of them are somewhat spindle-enlarged and occasionally abruptly so. Young roots are white, later they become yellowish, then noticeably orange in color, and when old they are brown-gray. The crown branches are short, rather erect and crowded, and without spreading rhizomes (See Fig. 75.). The foliage is medium-coarse in comparison to the other species of the genus; individual leaves are as much as 1.5 m. in length and usually no more than 3 cm. in width. The mound of foliage is ascending-spreading and it reaches a height of from 60 to 90 cm. (See Fig. 76.). In autumn the foliage becomes wiry and rich brown in color and remains in a conspicuous mound over winter. In spring the old foliage breaks in the crown leaving considerable fiber.

The scapes of well-grown plants rise to a height of from 1.8 m. to at least 2.2 m., and are the tallest for any species of *Hemerocallis* known to the writer. They are relatively slender and well-branched with usually from 5 to 7 nodes and with branches in the axils of nearly all the bracts (See Figs. 76 & 74.). No more than three bostryxes have been observed in a primary inflorescence and these have slender axes and as many as seven flowers to a bostryx. In the laterals below the primary inflorescence vegetative dichotomy is frequent; but also for certain of the plants many laterals have but one bostryx, a feature seldom seen thus far in any other species. The flowers (See Fig. 74.) are strictly nocturnal in opening. According to observations over a period of several years the flowers started to open at hours ranging from 3:00 to 5:00 P. M. and became fully open at hours ranging from 5:00 to 9:00 P. M. On many days a set of flowers of the previous night was fully closed at 5:00 A. M., but frequently in cool weather the flowers did not fully close until as late as 8:00 A. M. and occasionally the closing was still later in the forenoon. The flowers are fragrant, pale yellow in color, and trumpet-shaped with the perianth tube frequently as much as 4 cm. in length. The widely open flowers may have a spread of at least 10 cm. At The New York Botanical Garden the periods of flowering for the group of plants of this species during several years of observation have extended from the middle of July until late in October.

¹ Daylilies, 1-119 pages, by A. B. Stout. 1934. The Macmillan Co., N. Y.

² Brief reference to this species was made by Dr. Stout, **without Latin diagnosis**, in Jour. N. Y. Bot. Gard. 43:240. 1942.

There is considerable variation in the size and shape of the capsules borne by different plants. Well-developed capsules characteristic of different plants have ranged from one inch to one and one-half inches in



Fig. 76. Typical plant of *Hemerocallis altissima* sp. nov. Photo taken Aug. 5, 1941; rule is 5 feet tall.

described as having perianth tubes only 2.8 cm. in length and the scapes are described as more than 60 cm. tall.

length, and for some plants the shape is oval with a rounded apex while for others the apex is truncated. The seeds are black, smooth, and rounded or somewhat angled. In size they are intermediate between the large-sized seeds of *H. flava* and the small-sized seeds of *H. minor*. Counts of chromosomes have been made for two of the original plants from Purple Mountain and five of their seedlings, and for all of these the diploid number of chromosomes is twenty-two ($2n = 22$) which is the normal number for all known species of *Hemerocallis*; but there are, however, several triploid ($3n = 33$) clones of *H. fulva* in cultivation.

Of the known species of *Hemerocallis* the *H. altissima* is similar to *H. Thunbergii* in habit of growth, color of foliage in autumn, and color of flowers. But the plants are much taller, the flowers are larger and have a longer tube, the season of bloom is later, and the flowers are more strictly nocturnal in opening. A type in cultivation in Japan (possibly a clone) described under the name *H. sulphurea* Nakai appears to be more like *H. Thunbergii*; at least the flowers are de-

The type locality for wild plants of *Hemerocallis altissima* is Purple Mountain, Nanking, China; but the plants of this description are now growing at The New York Botanical Garden. The common or vernacular name here given to this species is an anglicized spelling and pronunciation provided by Dr. Roberta Ma from the Chinese name for Purple Mountain which in its entirety signifies Purple Enshrouded Mountain.

Herba perennis hieme dormiens, intermittenter augens. Radices crasse fibrosae vel satis fusiforme vel interdum abrupte dilatatae. Caudicis rami compacti; rhizomata nulla. Scapi ramosi usque 2.2 m. alti. Bostrychum axes graciles elongati, usque 7-flori. Flores pallide flavi suaveolentes nocturni infundibuliformes, in viciniis urbis Novae Eboracensis florentes ab medio mensis Julii usque finem Octobri. Capsulae magnitudine formaque variabiles, saepissime ovatae vel obovatae, 2-4 cm. longae. [Figs. 74, 75, & 76]

*The New York Botanical Garden,
August 15, 1942.*

AMARYLLIDS OF CEYLON¹

T. H. PARSONS, *Curator,*

Royal Botanic Garden, Paradeniya, Ceylon

The following species of amaryllids seem to be native to Ceylon although they may be found in India as well:

Crinum asiaticum, Linn.; It is commonly known as "Tolabo" in Sinhalese and as "Vichamunkil" in Tamil. It is very common along the sandy sea coast chiefly in moist regions and it flowers in February-May producing white, sweet-scented flowers.

Crinum defixum, Ker. It is known as "Hin-tolabo" in Sinhalese. This species differs from *Crinum asiaticum* in the possession of larger bulbs, leaves smaller and very much narrower. The flowering umbel produces about 6-15 flowers while in *Crinum asiaticum* 10-30. It flowers between March-July. The filaments are white, and the style is purple.

Crinum latifolium, Linn. This has a larger bulb than any of the other Ceylon crinums. The leaves are smaller than in *Crinum asiaticum* but larger than in *Crinum defixum*. The style is longer than the stamens.

¹ A similar report by Mr. Parsons (Herbertia 3:79, 1936) was published in a former issue, but the present article includes additional species, and in most cases the descriptions are more detailed. We are grateful to Mr. Parsons for remembering us in these troublous times.—Ed.

Crinum zeylanicum, Linn. It is found in damp places in the low country. It is very common, but seems to show great variations. The bulb is 6-8 inches in diameter; leaves few, short and undulate; flowers white with pink or purplish stains down the center.

Pancratium zeylanicum, Linn. It is known as “Wal-lunu” in Sinhalese. The bulbs are very small, 1½ to 2 inches in diameter, leaves linear-lanceolate, 5 to 11 inches in length, acuminate. It flowers in January; flowers white, fragrant. It is also found in other parts of tropical Asia.

Pancratium verecundum, Ait.

Pancratium triflorum, Roxb. (*Hymenocallis tenuiflora*, Herbert.)

INTRODUCTION OF HEMEROCALLIS SPECIES TO BRITISH GARDENS

FRED. J. CHITTENDEN, *England*

There is always interest and often difficulty in trying to discover when and how plants came from their native homes to our gardens, and it is sometimes not easy to discover where their native home was. The universally loved Madonna Lily and the Blue Flag Iris are good examples of this, and so also is Hemerocallis. Linnaeus knew two forms of Hemerocallis which he distinguished in the 2nd edition of his Species Plantarum in 1762 as *H. flava* and *H. fulva*; but at first he had treated them as varieties of one species under the names *H. Lilio Asphodelus (a) flavus* and *H. Lilio Asphodelus (B) fulvus*—that was in 1753. The name Hemerocallis existed long before this, however, for it is found in the writings of Dioscorides and Pliny who used it at the very dawn of the serious study of plants. Dioscorides gave the name to a yellow-flowered Lily, and as it fits so well the fleeting nature of the flower, his plant may well be our *Hemerocallis flava*. Did he then know it as a wild plant or had it even then been introduced from some remote region into cultivation? *H. flava* and *fulva* have been recorded as growing wild and sometimes fully naturalized in large masses in various parts of Central Europe: *H. flava* as wild in S. France, Italy, Caucasus, W. Siberia and Japan: *H. fulva* as wild in S. France, Italy, Mid and S. Russia, and Transcaucasus, but there has always been a feeling that their true home lay in the far east—in China perhaps—for it is there or thereabouts that the other species of the genus have been found.

There is nothing innately impossible in the idea that they may be wild in Europe though their nearest relatives have their home thousands of miles to the east. There are examples among other plants. Forsythias

belong to China and Korea, but *F. europaea* is a native of Albania; Philadelphus belongs to E. Asia and N. America, but *P. coronarius* is a native of S. E. Europe; Spiraea too belong in the main to E. Asia and N. America, but some species are native of S. and S. E. Europe, though there are here connecting species across the continent of Asia.

Does such evidence as we have point to their indubitable wildness in Europe? Vernacular names sometimes help to clear up the matter where common or conspicuous plants are concerned, and these are certainly conspicuous. Yet the vernacular names seem to be such as are imposed, not such as arise spontaneously among the bulk of the people, like our Daisy and Buttercup, or the American Mayflower and Black-eyed Susan. The names in Germany are *Taglilie* and *Tagschöne*; in Holland, *Dag-lilie*; in Italy, *Giglio turco*; in Roumania, *Crini-galbeni*; Czecho-Slovakia, *Denivka*; in Croatia, *Ljiljanka*; translations or near translations of *Hemerocallis* as is our own name, Day-Lily. There is no confirmation of European nativity here, and there is direct negative in the fact that, as Focke pointed out in 1888, *H. fulva* never sets seed. It is no uncommon thing for a plant to be infertile to its own pollen. The common field poppy is, yet if pollen of another seedling field poppy finds its way to the stigma seed is set abundantly. But no two plants of *H. fulva* have been found to fertilize one another, and in fact all the plants are but pieces of one carried from place to place by one means or another and establishing themselves so well as to become quite at home. *H. flava* sets seed with its own pollen but seldom and, again as Focke reported, the seedlings are often without chlorophyll and unable to maintain themselves; but foreign pollen, i.e. pollen from another seedling of *H. flava*, results in full fertility.

H. fulva does not seem to have been found truly wild anywhere yet, but closely allied forms have come to our gardens from Japan. A double-flowered form (*flore-pleno* with a synonym *H. disticha fl. pl.*) came to this country in 1860, and 4 years later a double flowered variegated form called *Kwanso fl. pl.* also came from Japan, but the flowers are less double than in *flore-pleno*. There is also a variety with flowers similar to *Kwanso fl. pl.* but with green leaves, while var. *Cypriana*, with bright glossy green leaves and a larger number of flowers in the inflorescence than in the type, came to us from China in 1906, its flowers being brownish outside. Whether this is the origin of our old *H. fulva* to which Dr. Stout has given the name "Europa" or not remains to be seen. Another variety, *maculata*, which has slightly paler flowers with a darker median band came also from China in 1897.

The evidence we have then points, not to Europe as the native home of *Hemerocallis fulva*, but to eastern Asia and Mr. G. P. Baker in the Journal of the Royal Horticultural Society, 1937, finds no difficulty in supposing that it came thence quite early in the Christian era or before, by the trade routes along which so many Chinese commodities found their way to Antioch and the civilization of southern Europe. Whether it was the beauty of the flower or some real or assumed medicinal virtue that led to its introduction is not clear. It had both, but it was usually the latter that in early days most recommended a plant to cultivators.

Be that as it may both *H. flava* and *H. fulva* arrived in England sometime before the end of the sixteenth century and had become well known when John Gerard wrote his Herbal, published in 1597. Apparently John Gerard did not like *H. fulva* very much for the following is the bulk of his remarks: "This plant bringeth forth in the morning his bud, which at noone is full blowne, or spread abroad, and the same day in the evening it shuts itself, and in a short time after becomes as rotten and stinking as if it had been trodden in a dunghill a moneth together, in foule and rainie weather; which is the cause that the seed seldome followes, as in the other of his kinde, not bringing forth any at all that I could ever observe; according to the old proverb, Soone ripe, soone rotten". Perhaps they had been brought here by the Crusaders but there seems no clear indication as to when they actually reached our shores.

There appear to have been no new forms introduced until the impetus given to botanical discovery by the enthusiasm imparted to his students by Linnaeus, and all subsequent immigrants came from eastern Asia. First came *H. minor* in or about 1768 which Philip Miller, the great head of the Chelsea Physic Garden briefly describes in the 8th Edition of his Dictionary; then about the end of the eighteenth century, came a form of *H. fulva*, published as *H. disticha* in 1798 and figured by Robert Sweet in his British Flower Garden in 1823: it was distinct from the original of *H. fulva* but so much like it that it is clearly conspecific.

In the first half of the nineteenth century there began a closer connection between China and even Japan and the western world, and an opportunity occurred for a greater influx to our gardens of the plants of those lands so rich in the gifts of Flora. It was Philipp Franz von Siebold who found favour with the Emperor of Japan and whose enterprise led to many a good garden plant reaching us. Among them was the dwarf *H. Dumortieri* which reached Europe in 1832, and before long it came to our shores and was grown also as *H. rutilans* and *H. Sieboldii*. Then in the second half of the century about 1860 from Japan there came *H. disticha fl. pl.* and in 1862 *Kwanso fl. pl.* both double forms of *H. fulva*. Messrs. Veitch the great nurserymen of Chelsea grew and showed them, and later first *H. Middendorffii* in 1887, then *H. aurantiaca* about 1890 and the form of the latter so well known as *H. aurantiaca major* about 1895. The dates given are for the most part those in which the plants in question were shown before the Royal Horticultural Society in London and thus are a little later than the actual year of introduction. Some of them came to us direct from Japan, but others via various botanical gardens on the Continent, for there has always been exchange of plants between these gardens.

The introductions from China during the present century, especially through the great collectors E. H. Wilson and G. Forrest have added a few charming plants to our gardens, such as *H. Forrestii*, *H. nana* and *H. plicata*; others have come via America where Dr. Stout's enthusiasm for the genus has resulted in the attainment of still other species, but none of them has so far gained a really sure foothold in English gardens

generally and possibly they will not; for a host of beautiful garden-raised hybrid seedlings now competes with them for favour, and many of that host—of which others will tell—of both English and American birth are likely to claim preference.

DAYLILY ADAPTATION

HAMILTON P. TRAUB

Since reporting on daylily clones originated by the writer in Florida in 1940 HERBERTIA, the opportunity was afforded to test these clones farther north at Beltsville, Maryland, near Washington, D. C. All of these were grown from the summer of 1940 to the summer of 1942 in gravelly clay loam on a knoll—a very severe test—and some also in a silty clay loam on a lower site. On the exposed knoll no plants were lost from winter killing but on the lower location some plants did not sprout in the spring. The whole question of winter hardiness of daylily clones needs to be thoroughly investigated to clear up the reports of winter killing in Illinois, Massachusetts and other regions.

During the flowering season notes were taken on the effect of sunshine on the condition of the flowers, and this information is summarized in Table 1. The flower condition at 6 p. m. is indicated on the scale,—*Excellent*, as good as or better than on first opening; *Good*, slightly less presentable on hot days; *Fair*, markedly off grade by the afternoon; *Poor*, flower fades in the morning and is not presentable in the afternoon on hot days.

In Table 1, the ratings under Florida conditions are contrasted with those under the less hospitable environment in the vicinity of Washington, D. C., at Beltsville, Md. Under these conditions, a number of clones received a lower rating and should be discarded for that region. Surprisingly some clones did better than in Florida. Plant habit and flower size could not be scored finally in all cases since some plants were small, and all were not grown under optimum conditions but rather under hardly average good culture. However, preliminary ratings have been made. The perigone segments of *Theodore Mead* and *Indian Chief*, for instance, were much shorter than under Central Florida culture.

It is the writer's opinion that all clones rating *Fair* or *Poor* in flower condition should be discarded without delay, and those rating *Good* should be kept until superceded by similar better clones. Those rating *Excellent* have permanent value.

(1) Clones rating *Excellent* will only be displaced, if at all, as a result of keen competition as daylily breeding progresses. In this class are *Carnival*, *Corinne Robinson*, *Dr. Stout*, *Duchess of Windsor*, *Emberglow*, *Fire Red*, *General MacArthur*, *George Kelso*, *Golden Glow*, *Granada*, *Helen Wheeler*, *Indian Chief*, *John Blaser*, *Lidice*, *Mildred Orpet*, *Theodore Mead*, *Victory Taierhchwang* and *Wekiwa*.

(2) Clones rating *Good* are distinct and valuable in themselves and for further breeding work, some representing distinctly new departures, but should yield their place to similar better clones when they appear.

This class includes *Dr. Hughes*, *Happiness*, *Elaine*, *Fred Howard*, *La Tulipe*, *Mayor Starzynski*, *Cecil Houdyshel*, *Peony Red*, *Queen Wilhelmina*, *Reba Cooper*, *Rouge Vermilion*, *Russell Wolfe*, *San Juan*, *St. Joan*, and *Victory Montevideo*.

(3) Clones rating *Fair* and *Poor*, and also some rating *Good* for flower condition, have been marked for discard. Some not so marked apparently have been superceded and should also be discontinued. Plants

TABLE 1

Comparative rating of daylily clones in Florida (1940) and Maryland (1942).

Clone	Flower condition at end of day:1				Ratings:	
	Excel- lent	Good	Fair	Poor	Florida 1940	Maryland 1942
Audrey Blaser			*		7.8	Discard
Carnival	*				9.6	9.8
Cecil Houdyshel		*			8.0	8.5
Charlotte Traub		*			8.5	Discard
Corinne Robinson	*				9.0	9.0
Dr. Hughes		*			9.0	8.5
Dr. Stout	*				9.8	9.8
Duchess of Windsor	*				9.8	9.8
Elaine		*			9.0	8.7
Emberglow	*				9.0	9.0
Estelle Friend			*		8.0	Discard
Fire red	*				8.8	9.0
Fred Howard2		*			9.5	8.8
General MacArthur	*				9.9	9.9
George Kelso	*				9.6	9.7
Gloriosa		*			7.6	Discard
Golden Glow	*				8.6	9.6
Granada	*				9.0	9.5
Happiness		*			8.5	8.6
Helen Wheeler	*				8.5	9.0
Indian Chief	*				9.6	9.2
John Blaser	*				8.8	9.6
La Tulipe2		*			9.6	8.8
Lena Hughes		*			8.0	Discard
Lidice3	*				8.8	9.8
Mauve Rose				*	7.5	Discard
Mayor Starzynski		*			9.5	9.0
Mildred Orpet	*				9.8	9.8
Peony Red		*			9.0	9.0
Queen Wilhelmina		*			8.6	8.6
Reba Cooper		*			8.5	8.6
Rouge Vermilion		*			8.6	8.9
Russell Wolfe		*			8.5	8.7
San Juan		*			9.1	9.0
St. Joan		*			9.0	8.5
Theodore Mead	*				9.8	9.8
Victory Montevideo2		*			8.5	8.8
Victory Taierhchwang	*				8.5	9.2
Wekiwa	*				8.5	9.2

1 **Excellent**=as good or better at end of day; **Good**=still quite presentable; **Fair**=markedly affected; **Poor**=flower not presentable.
2 Clone especially valuable for further breeding work.
3 The original name, **Victory Suomussalmi** was so often misspelled that it was necessary to replace it with the more simple name. It seems fitting and proper to name it in honor of the martyrizd City of Lidice.

of all of these have been donated to others for trial, but in the light of these tests should not be listed in commercial catalogs,—*Audrey Blaser*, *Charlotte Traub*, *Estelle Friend*, *Gloriosa*, *Lena Hughes*, *Mauve Rose*.
Visitors who saw these clones in Maryland were uniformly charmed by practically all of these 39 clones, representing great variation in flower shape, size, flower color and pattern, and substance. Most day-lily enthusiasts are discarding the idea that they want all the flowers to

be of bright obvious colors and of one shape—large, full flower form. They realize that we must have infinite variety in order to make any plant permanently interesting. And pastel shades are much more soothing and pleasing than obvious colors. *Peony Red* was described, for instance, from the Maerz and Paul Color Dictionary and represents Peony species red. However, one visitor was disappointed that it was not a different red. *Lidice*, which blooms over a very long period, was a universal favorite. The ladies particularly liked *Carnival*, a very unusual color pattern of gay abandon, but one or two men did not like it apparently because they could not classify it.

These clones will now be tested in coastal California under conditions where *Fulva Europa* flowers from spring to early winter—in the fall its flowers are an excellent rosy pastel and they last from two to three days. Most likely it will be necessary to breed an entirely new race of clones that are adapted to the conditions of this coastal valley.

THE PROBLEM OF EVALUATING HEMEROCALLIS CLONES

L. H. MACDANIELS, *Cornell University*

As a newcomer in the American Amaryllis Society perhaps the appropriate thing to do would be to keep still at least until there was adequate opportunity to become better acquainted with society policies and its members. However, I find myself placed on two of the Society's Committees and have been encouraged to state an opinion as to what might be done by these. This I am pleased to do though it is with the realization that better acquaintance with the Society and its problems may change present opinions. There is some merit in the idea that a newcomer who is sympathetic with the aims of the Society might possibly have a better perspective regarding some matters than some of those who have been associated with the Society from the first.

Some ten years ago while casting about for a group of plants with which to work as a hobby, the advice of Dr. L. H. Bailey was sought. He suggested the Amaryllidaceae as a group with wide diversity of form and color and comparatively little known and used by gardeners. At the time some effort was spent in examining the literature and it was decided that because of the lack of hardiness of many of the genera and difficulties of handling with the facilities available, it was inexpedient to try it. The Liliiums were chosen instead and through the years have afforded ample interest and opportunity for work. The recent change to Floriculture as a profession instead of a hobby makes it possible to extend my interest to include this closely allied group of plants.

Obviously one does not become familiar with so varied and widespread a group as the Amaryllids overnight and a glance through the volumes of HERBERTIA makes it clear that there is much to learn. Early this summer I was fortunate enough to visit Beltsville, Maryland, and to be introduced by Dr. Traub to some of his selections in a garden and the large number of seedlings growing in the Station grounds. Some time was spent going around with Dr. Traub and Dr. Cooley as they

made selections from the many seedlings which were blooming for the first time. There were so many of great beauty and good substance that it was difficult to know what to discard. Flowers that did not stand up under the trying summer sun were rigorously eliminated—No matter how beautiful earlier in the day.

In Dr. Traub's garden, many of his own originations were growing. The plants were just getting established and the soil was none too favorable. Nevertheless many of the plants were blooming well and showed a surprising range of form and color from delicate pastels to the clear orange and yellow "selfs", and the more somber browns and reds. In the garden of Dr. Cooley, many of the older standard sorts were growing in the perennial border. The plants were in well established clumps and blooming profusely. Hundreds of seedlings were also growing luxuriantly in the back garden where cultural conditions made blooms of exceptional size and substance.

Observing these gardens and recalling the large plantings of Dr. Stout at the New York Botanical Garden brings home to me the large number of clones that are being selected, named and introduced. It is obvious that the *Hemerocallis* breeders are going through the same sort of cycle that has been followed by the breeders of Dahlias, Iris, and Gladiolus. At first in such a cycle, all varieties that have any merit are named and introduced. Later as progress in breeding is made, the number of breeders and their enthusiasm increases and new clones are introduced in quantity. At this time the need for some control is recognized and scoring schedules and rating committees are organized. On the basis of experience gained, satisfactory standards are established. All varieties are judged according to these standards and many discarded from the lists and from the trade. Finally, a sort of equilibrium is reached in which new varieties are thoroughly tested before naming and only clones of exceptional merit are introduced.

To me it appears that the *Hemerocallis* breeding of the Society is about midway in the cycle. Certainly the increase in the named clones has been phenomenal and continues so. Judging schedules have been set up and ratings given at least to the clones growing in the Florida gardens by J. V. Watkins and H. P. Traub and W. Hayward (HERBERTIA 1941). It remains now for a judging committee or committees to evaluate the different clones as they are grown in different parts of the country. In this process it may be expedient to modify the judging schedule which has been formulated as it is only by experience that such schedules are finally put into satisfactory shape. The committees for evaluating clones have already been set up and it is my intention to work with these in an attempt to have the evaluating done as soon as may be expedient. The present war situation puts restrictions on travel and will of course, impede this program. However, it is something which all members should keep in mind.

In order to facilitate the evaluation of clones grown in different parts of the country, it is highly desirable to establish test gardens in as many localities as possible. It has already been pointed out by Mr. Shull that this is a difficult and expensive thing to do. In some places

test gardens may be set up at universities and experiment stations where facilities for maintaining test gardens are already in operation. The test planting at Cornell University already has a good start through the efforts of Prof. Watkins of Florida and Dr. Traub. Dr. R. C. Allen has immediate supervision of the planting. Similar official Society test gardens* have been established at the University of Florida, the Southwestern Louisiana Institute, the Texas Agricultural Experiment Station, and by the Park Boards of Milwaukee, Wisc., and Des Moines, Iowa. Others will be authorized as the program develops. A summary of their accomplishments will be included in 1943 HERBERTIA. But we must rely in considerable part on amateurs who have the evaluation of varieties at heart and who will cooperate in getting together collections of clones for the scrutiny and scoring of the judges.

These test plantings can not be carried on indefinitely even at the experiment stations because of their expense. As I see the problem, collections should be assembled in different localities and different clones given a rating and discards made. Eventually the problem will boil down to maintaining a collection of the best clones for demonstration and observation with a relatively small area given over to testing of new introductions.

The whole matter of varieties is one with which all branches of Horticulture have to contend. With fruit varieties the problem is simplified somewhat in that a new sort to be worthy of trial at all must show real promise. The success or failure of a fruit variety depends on its capacity to make money for the grower. No grower except the amateur will attempt to grow a new variety until it has been tested rather thoroughly. With ornamentals such as the daylily, there is no such economic consideration and there is the tendency to introduce far too many new clones even though they can not be recommended as superior to the established older sorts. Introduction of a large number of new clones becomes a real detriment to the progress of the Society because buyers are disappointed in the performance of the new varieties in comparison with the old. Just because a clone is new is no real recommendation.

It appears to me that any system of scoring and evaluation by a committee of society members is almost sure to fail unless the hybridizers themselves use great self restraint in making their selections and introductions. As soon as the Society sets up a board that has to be too arbitrary, there are likely to be antagonisms aroused which are unfortunate for the Society. I have sometimes thought that the variety situation might be likened to a procession or parade passing in review. In the parade at any one time, are old varieties which because of merit have withstood the test of time and are still going strong, and also those which are beginning to fall behind. Along with them are the new introductions which have recently joined and which show promise. As time goes on, stragglers fall out and remain as names only. New sorts may forge ahead in the line or if they lack merit, they too are left behind. Certainly the variety parade is in a continuous state of flux.

* Complete addresses are given under Roster of Officers and Committees.—Ed.

With many flowers and fruits the clones that were once important have fallen by the wayside and their places taken by newcomers of greater merit. Carrying this idea further, it is the duty of the evaluation committee to see that really promising newcomers get a place in the line, but also that many that are unworthy never join it at all and also that the older mediocre sorts are left behind and forgotten. Varieties of doubtful merit may well be tested at the test gardens, but they should not be placed in the trade. This testing and rating of clones should be a family affair and kept mostly within the Society. That this is a difficult task has already been pointed out by Mr. Shull in the 1941 HERBERTIA.

An aid in the evaluation of new varieties will be a check list of all introductions. This should be compiled by the evaluation committee and might well be prepared for the 1943 yearbook. Such a list would be a starting point for the evaluation committee's use in the future.

At the present time, I am not sufficiently familiar with research needs in the Amaryllidaceae to give a valid opinion as to what is most desirable. An examination of the yearbooks of the Society indicates that much valuable work has already been done and that it will take careful consideration to determine where emphasis may best be placed. In any case in a Society of this sort, research certainly should be encouraged on the part of the amateurs who have interest in special problems.

In conclusion let me say I am well aware that at the present time my knowledge of *Hemerocallis* varieties is entirely inadequate to be a competent judge. It is however, possible to be of service to the Society in organizing the evaluation program and this I expect to do with the help of those in the Society who are interested in this group of plants. Because of the war situation, undoubtedly our program will be delayed. We can, however, all work along with it in so far as may be expedient. With each of us, working with plants is, I am sure, a source of recreation and as such many will be kept going during this time of stress.

UNIVERSITY OF FLORIDA DAYLILY TRIAL GARDEN

More than 250 plants representing 50 standard clones were sent to the Regional Test Gardens by the University of Florida in July 1942. Under the direction of John V. Watkins, the Daylily Display Garden on the Campus of the University of Florida has become well known to gardeners in the Lower South during the past decade. The exchange plants were divided from the large clumps that are growing "in threes" in the permanent beds of this experimental planting. As new introductions become sufficiently large, divisions will be offered each season to the directors of the gardens that are cooperating in the regional testing of *Hemerocallis*. —Ed.

EVALUATION OF DAYLILIES FOR NORTHERN FLORIDA

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These notes follow an original article by the same title that was published in HERBERTIA, volume 8. The evaluations are based on observations and data taken in the garden at the home of the writer. The clones were acquired, for the most part, in the summer of 1941 and were planted in their present locations in September 1941. The official score card for rating Daylily clones on page 126, 1940 HERBERTIA, was used in arriving at the numerical values.

3. CLONES IN COMMERCE LESS THAN THREE YEARS.

<i>Clone</i>		<i>Rating</i>	<i>Clone</i>		<i>Rating</i>
<i>Afterglow</i>	(Stout)	9.4	<i>Port</i>	(Stout)	9.1
<i>B. H. Farr</i>	(Stout)	9.6	<i>Queen Bess</i>	(McDade)	8.1
<i>Bicolor</i>	(Stout)	9.5	<i>Red Bird</i>	(Stout)	9.5
<i>Charmaine</i>	(Stout)	8.9	<i>Takoma</i>	(Norton)	9.0
<i>Dominion</i>	(Stout)	8.7	<i>Taruga</i>	(Stout)	9.7
<i>Mermaid</i>	(McDade)	8.1	<i>Wolof</i>	(Stout)	9.4
			<i>Welaka</i>	(Watkins)	9.5

SUMMARY OF CLONES IN COMMERCE FOR LESS THAN THREE YEARS.

<i>Numerical Ratings:</i>	<i>Number of Clones:</i>	<i>Percentage:</i>
9.6 - 100 Excellent	2	16.0
9.1 - 9.5 Very good	6	50.0
8.6 - 9.0 Good	3	25.0
8.1 - 8.5 Fair	1	9.0
		100.0

AMARYLLID GENERA AND SPECIES

In this department the descriptions of amaryllid genera and species translated from foreign languages will be published from time to time so that these will be available to American and British readers.

Ixiolirion karateginum, Lipsky, acta horti petropol. 18:108-110. 1901.

Plant 2 inches to half a foot or almost a foot high. Bulb ovate, the segments oblong-ovate, gray-brown. Stem mostly with the greater part sunk in humus, the free part straight, much exceeded by the leaves. Leaves 3 or 4, linear, plicate, long-attenuate toward apex. Flowers 2 to 7, small (sometimes very small, not larger than those of *Gagea*), pale lilac or almost white, subumbellate, subtended by scarious-margined bracts. Corolla (living) rotate, the tube short, the limb spreading, 4 times longer, the inner segments obovate, the outer linear-elliptic, all green-mucronate-apiculate at apex and attenuate at base, forming a tube. Anthers subglobose or a little longer than wide, sulphur-yellow, the filaments white.

In habit, method of growth and flower color near *I. Kolpakowskianum* Regel, but differing however in much smaller flowers, in the proportions of the perigonium, the segments broader and of different shape, the tube proportionately shorter, the anthers punctiform, the filaments conform, not unequal.

Habitat.—Buchara, Prov. Karateginjugum

Boophone disticha (L. f.) Herb. var. *Ernesti-Ruschii* Dtr. & G. M. Schulze, Bot. Jahrb. Engl. 71:520-521. 1941.

Differs from *B. disticha* (typical) in having white flowers, the spathe about 2 cm. long, the pedicels about 3.2 cm. long or shorter, the perianth tube about 0.5-0.6 cm. long, the perianth segments about 2 cm. long.

Gethyllis Angelicae Dtr. & G. M. Schulze, new sp. Bot. Jahrb. Engl. 71:521-522. 1941.

Bulb unknown, covered with a scarious collar of bulb scales; leaves numerous, narrowly linear, glabrous, widened toward base, up to about 15 cm. long, about 0.1 cm. wide; perianth tube cylindrical, the larger part included in a collar of scarious scales, about 6.5 cm. long or longer?, dilated toward the throat like a funnel, the segments of the perianth oblanceolate, about 4.5-5.5 cm. long, about 1.5-2 cm. wide; stamens 6, inserted in the throat of the perianth, the filaments about 0.3-0.4 cm. long, the anthers 3 on each filament, varying in length among themselves, up to 2 cm. long; style varying in length, more or less exserted from the throat.

Cryptostephanus Merenskyanus Dtr. & G. M. Schulze, Bot. Jahrb. Engl. 7:522-525. 1941.

Rhizome tuberous, ovoid, about 3 cm. long, 2.5 cm. thick; leaves strap-shaped, long sheathing (the sheath tubular), rounded at apex, altogether about 60 cm. long, about 3.5 cm. wide; scape erect, about 29 cm. long, about 1 cm. wide; valves of the spathe several, lanceolate, up to 4 cm. long; umbel lax, the flowers pedicellate, the pedicels varying in length, about 2 cm. long; tube about 3 cm. long, the perianth segments ovate-lanceolate, papillose at apex, about 1 cm. long, about 0.4 cm. wide; corolla scales 12 fleshy, small, toothlike gibbositities situated in pairs at the base of filaments, about 0.1 cm. long and broad; filaments filiform, dilated at base, exserted from the throat of the perianth tube, about 0.3 cm. long; anthers oblong-sublinear, about 0.5 cm. long; ovary subovoid, about 0.6 cm. long, about 0.3 cm. wide; style equal to the perianth, or exserted from the perianth?

Cryptostephanus (?) *Herrei* Leighton, South Afr. Gard. 22:137, 143. 1932.

Leaves 2 each year, strap-shaped, emarginate at apex, glaucous, up to 34 cm. long and 4.5 cm. wide; peduncle flattened, 36 cm. long, 1.5-2 cm. thick; spathe valves 4, narrowed upwardly, 7 cm. long, 1.2 cm. wide at base; pedicels 3-4 cm. long; flowers pendulous; perianth rather thick in texture, the tube red, 3-3.5 cm. long, the outer segments 1.5 cm. long, 6 mm. wide, the interior segments 1.4 cm. long and 7 mm. wide, greenish-yellow; corona composed of 12 scales 1.5 mm. long; filaments 6 mm. long; anthers 3 mm. long, attached at the middle; ovary obscurely angled, 8 mm. long; style equalling the perianth.—Richtersveld, Karrachab, Namaqualand, Africa, collected by Herre (S. U. G. 3461). Flowers in March and April.

Cryptostaphanus haemanthoides Pax, Engl. Bot. Jahrb. 15:142-143. pl. 7. 1893.

Leaves unknown; scape low, thick; spathe valves many, reflexed, linear, acuminate; flowers dark purple, very numerous, crowded, pedicellate, the pedicels equalling the flowers or a little shorter; perianth tube cylindrical, elongate, straight, a little widened toward the throat, the segments ovate, a little bearded at apex, one half shorter than the tube, spreading or subreflexed; corona composed of 12 free, linear, yellow scales, one half shorter than the perianth, situated in pairs between the filaments; filaments short, inserted on the perianth tube between the corona scales, filiform, adnate to the tube, decurrent, exserted from the throat together with the corona scales; anthers oblong-linear, equal to the filaments; ovary subglobose, 3-celled, the cells many-ovulate; style filiform, exserted from the throat, exceeding the anthers, crowned with a very small stigma.

FOREIGN AMARYLLIDS WANTED

In this section, the names and addresses of those who desire to import amaryllids from foreign countries are entered. There is a very great need for the importation of new species for use particularly in hybridizing.

Mr. L. S. Hannibal, Concord, Calif.

Mr. W. M. James, Ojai, Calif.

Mr. Cecil Houdyshell, La Verne, Calif.

Note.—Those interested in importing amaryllids should send in their names to the Secretary for inclusion in 1943 HERBERTIA. —*Ed.*

REGISTRATION OF NEW AMARYLLID CLONES

Description of new clones of hybrid amaryllids for this section should reach the editor by June 1 if at all possible. Information sent after that date may be held over to the next issue if space is not available. This information is published to avoid duplication of names, and to provide a place for authentic recording of *brief* descriptions. Names should be as short as possible—one word is sufficient. It is suggested that in no case should more than two words be used.

At present there is a limit to the number of descriptions included from any one member. Hereafter not more than five brief descriptions of clones under each generic heading will be published free of charge from any one member in any issue of HERBERTIA. Additional descriptions will be published in the advertising section at regular ad rates. The first five descriptions will appear in this section and the excess will be continued in the section entitled, "Buyers Guide".

HYBRID DAYLILY (HEMEROCALLIS) CLONES

Trial Gardens. Cooperative daylily trial gardens have been established at (1) *Cornell University, Dept. of Floriculture, Ithaca, N. Y.*; (2) *University of Florida, Dept. of Horticulture, Gainesville, Fla.*, (3) *Southwestern Louisiana Institute, Dept. of Horticulture, Lafayette, La.*; (4) *Whitnall Park Arboretum, Milwaukee City and County Park Board, Milwaukee, Wisc.*; (5) *Texas Agricultural Experiment Station, Dept. of Horticulture, College Station, Texas*; and (6) *Des Moines Park Board, Des Moines, Iowa*. [Complete addresses are given under *Officers and Committees*, below.]

Introducers should send complete collections of hybrids to these cooperating agencies in order that the new daylily clones may be impartially evaluated.

Introduced by Glen Saint Mary Nurseries Company, Glen Saint Mary, Florida. Originator, John V. Watkins.

Welaka. Foliage very narrow, gracefully horizontal spreading, to 18 inches in height. Scapes slender, somewhat declinate, to 29 inches, once branched in the upper three inches. The blossoms, opening in late

May in Gainesville, Florida, are medium sized, of good substance, distinctly crepe-like and rippled in texture. The color is Mandarin Orange (M&P* Plate 11 B-2) suffused with a rosy fulvous tone. The flowers are quite distinct from those borne by the commercial varieties that are growing in the Daylily Display Garden at the University of Florida. This seedling resulted from five generations of selective breeding and has been under observation since it first bloomed in May 1939.

Introduced by Willard M. Kellogg, North Granby, Conn.

Cantabile. Height: 27 inches; bloom size $4\frac{1}{2}$ in.; sepals $\frac{7}{8}$ in. wide; petals $1\frac{1}{4}$ in. wide; sepals—cream flushed rose; petals rose, cream band, fluted cream edge; yellow throat. Branching: Fair; substance: Very good. Season: Medium early.

Tigridia. Height: 26 inches; Bloom size: $4\frac{1}{4}$ in.; petals— $1\frac{1}{2}$ in.; Sepals— $\frac{7}{8}$ in. wide; flower almost identical in form to the Tigridia; Effect of pure copper orange with overlay of sparkling gold; heart deep gold; texture very pebbly, somewhat like seersucker cloth. Branching: Excellent—span of 1 foot. Substance: Excellent, very firm. Season: Medium early.

Pink-a-Boo. Height: 36 in.; size: 3 in.; P—1 in.; S— $\frac{1}{2}$ in. wide; effect of pink mauve, lighter at edges, gold heart; by Dictionary of color: plate 10, 9A with hint of muskmelon rose, and mauve. Substance: Good, fades evenly. Branching: Excellent, 12 inch span. Season: Early.

Bold Commando (Thompson-Kellogg). Height: 60 inches; size: about $4\frac{1}{2}$ to 5 in.; scarlet red with center band of cream yellow. Substance: Excellent. Season: Mid.

October Sunset. Height: 42 inches; size: 4 in. P— $1\frac{1}{8}$, S— $\frac{3}{4}$ in. wide; effect: rich chestnut red self. It does not burn, and does not fade severely. By chart—much brighter and more intensified than Pheasant Testaceous. Halo of Korea. Substance: Very good and firm. Branching: High, poor, but foliage so remarkable as to discount high branching, for the lush leaves reach to a height of 31 inches. Season: late, here almost all August.

Totem. Height: 44 inches; size: 5 in; S—1"; P— $1\frac{1}{4}$ " wide; bright almost scarlet; self except for glowing gold heart; fades but very little. Substance: Excellent, very heavy. Branching: Fair.

Cathedral Window. Height: about 42"; size: $4\frac{1}{2}$ in. across; effect of bright rose and copper blend. Substance: Good to excellent. Season: Mid.

Blood. Height: only about 26; Size: 4"; effect is of pure velvet red—or rather blood-ruby, very deep. Substance: Extremely heavy. Season: Mid.

Mandalay. Height: 40"; size: 4" across; S— $\frac{3}{4}$; P— $1\frac{1}{4}$ " wide; effect of brilliant pink blend, a pinker Talisman rose. Substance: very stiff and smooth; holds up all day. Season: Long, early to mid.

* Maerz and Paul, A Dictionary of Color.

Seminole. Height 40 in.; flower 4½ in.; P—1½; S—1 inch wide; bright bicolor, approaching blend of orange red and peach; substance excellent, fades, but very attractively; heavy ruffles stay fresh for a long period; midseason.

Introduced by Eric E. Nies, Hollywood, Calif.

Rosy Day. Height 3 ft.; medium yellow throat, sepals yellow, edges washed with rose; petals, inner half yellow, outer half rose; segments recurved except lowest which extends forward without recurving; very fragrant.

Introduced by Robert Wayman, Bayside, Long Island, N. Y.

Apache—29 in.; flowers 7 in.; narrow segments Dragon's Blood Red, wider segments orange cinnamon on center portion with star of bordeaux. Golden yellow throat.

Bordeaux—44 in.; flowers 5½ in.; rich velvety Bordeaux, uniform throughout, just faintest hairline of lighter tone down center of wider segments. All petals smooth as satin and recurved.

Brilliant—32 in.; flowers 6 in.; pure carmine, lighter narrow hairline down center of segments. General effect, brilliant carmine self with bright orange star at throat. Perfect form, petals recurved.

Brown Beauty—32 in.; flowers 5 in., soft brown tone, an artist termed it copper bronze.

Brown Symphony—34 in.; flowers 5 in.; Hazel to Coffee Brown with Hays Rust star and soft yellow vein down center of segments. Nicely formed.

Carmine Champion—42 in.; flowers 6 in.; pure carmine self; Huge flowers of fine form.

Carmine Gem—32 in.; flowers 6 in.; Carmine self with a brilliant orange throat.

Duchess—32 in.; Nopal red.; segments recurved and uniform in color.

Exquisite—40 in.; flowers 6½ in.; Pure Pompeian Red. Color uniform. Deep orange throat.

Extravaganza—48 in.; flowers 7 in.; Maroon with ⅛ in. pure orange stripe down center of segments and brilliant orange throat; striking and colorful.

Fireworks—40 in.; huge flowers, 7 to 8 in. pointed segments copper red blend with deep orange throat.

Forest Fire—30 in.; flowers 6 in.; exceedingly rich, uniform velvety, real Ruby Red with small orange star at throat.

Glamour—40 in.; flowers 6 in.; wider segments Brick Red; narrower segments same color, heavily brushed over an orange ground. Brilliant orange throat.

Grenadine—26 in.; flowers 5½ in.; Color close to Grenadine Red. Small orange throat.

Jack Rose—48 in.; Flowers 5½ in.; True Brazil Red self with narrow hairline of yellow down center of wider petals.

Pink Beauty—34 in.; Flowers 5½ in.; soft pink (Onion Skin Pink) with brilliant light yellow stripe down center of segments.

Pink Champion—42 in.; flowers 5½ in.; Deep pink or light russet in effect; narrower segments Flesh Ochre, wider segments Carrot Red (a deep pink).

Pomegranate Beauty—39 in.; flowers 5 in.; Pure Pomegranate Purple self, small orange throat.

Rapture—25 in.; flowers 5 in.; Brilliant velvety rich oxblood red, color uniform.

Red Beauty—28 in.; flowers 6 in.; Jasper Red, almost Fire-Engine Red in brilliance with copper suffusion and distinct copper edge. Brilliant orange throat.

Red Brilliance—34 in.; flowers 5½ in.; somewhat more brilliant than Jasper Red, uniform throughout with lemon chrome throat.

Red Empress—30 in.; flowers 5 in.; between Flame Scarlet and Grenadine Red, with Cadmium Orange throat in fine harmony.

Red Flare—36 in.; Flowers 6 in.; English Red with Morocco Red star and small chrome throat.

Red Glory—44 in.; flowers 5 in.; Ox-blood Red with small orange throat.

Red King—33 in.; flowers 5 in.; pure brilliant deep rich Spectrum Red to Scarlet, uniform with slightly darker velvety area toward the center. Brilliant orange throat.

Red Lustre—32 in.; flowers 6 in.; huge brilliant lustrous Ruby Red.

Red Raider—36 in.; flowers 6 in.; Brazil Red overlaid Morocco Red, color uniform with deep orange throat.

Red Satin—36 in.; flowers 4½ in.; uniform rich velvety Bordeaux Red.

Red Skin—30 in.; flowers 6 in.; wider segments Brazil Red; narrow segments English Red. Deep red orange throat.

Red Sox—Height 38 in.; flowers 6 in.; true Carmine pure and uniform with lemon chrome throat.

Red Splendor—43 in.; flowers 6 in.; rich velvety Bordeaux Red self with brilliant orange throat.

Red Wing—29 in.; flowers 6 in.; Acajou Red, approaching carmine. Color uniform with deep orange throat.

Rose Beauty—42 in.; flowers 5½ in.; dark old rose effect (Pompeian Red) with Van Dyke Red star of same general color tone but darker. Orange throat.

Rose Champion—39 in.; flowers 5½ in.; unusual deep old rose tone, near Pomegranate Purple self with deep yellow throat.

Ruby Queen—52 in.; flowers 7 in.; huge massive flowers, Morocco Red to Maroon with thin orange hairline down center of petals and brilliant lemon yellow throat.

Scarlet Beauty—27 in.; flowers 5 in.; pure scarlet with slightly darker flush toward throat and faint yellow vein down center of segments, but almost a self.

Terra Cotta—42 in.; flowers 5 in.; pure Terra-Cotta, with narrow, soft yellow stripe down center of wider segments.

Unique—34 in.; flowers 5 in.; unique blend, narrow segments light salmon, flushed soft rose; wider segments of striped effect, with buff stripe ⅛ inch down center; next to this, on each side of stripe, is a bright red area, then a crimped cream-colored buff border.

Wildfire—36 in.; flowers 5 in.; almost pure Spectrum Red, color uniform.

Zulu—39 in.; flowers 4½ in.; Bordeaux with black velvety flush; very rich and velvety color, uniform. Flower of perfect form.

Introduced by Wyndham Hayward, Winter Park, Fla.

Tahiti Belle (1924); medium compact to full flower dark claret petals and sepals, deep orange throat; medium height.

Babette (1942); dwarf to medium dwarf small-flowered compact orange.

Bolivar (1942); loose petaled semi-open type flower, rich copper red; medium height.

Dom Pedro (1940); large full open type flower, stiffly compact, fulvous copper shading on orange cream; medium to tall.

Glamor Girl (1941); wide-spreading somewhat separated petals and sepals, golden pastel-cream shading, light yellowish green throat; semi-dwarf to medium height.

Orlando (1941); large full, spreading flower, slightly uneven, brick to copper red tone with variation in shading; medium plus in height.

Introduced by Ralph W. Wheeler, Winter Park, Fla.

Angelus (22-80-2). Evergreen; large flower on 3 foot stems; good petal width, well open, with segments roundly recurved; color is light lemon yellow with very faint eye zone dusting. Stands up well all day in full Florida sun.

Brackel (27-44-6). Very large flower with wide petals, the well open flat face type with slightly recurved sepals; flowering stems 2½ feet; a vigorous grower and was a re-current bloomer in its first flowering

season at 21 months from seed; color pattern is something new in day-lilies and resembles an irregular, allover design in brocade in rich, dark wine and mahogany shades.

Empress (22-58-2). Evergreen in Florida; flowering stems 3½ feet; large flower of excellent form; of deepest purple maroon with bright, golden yellow throat, this same color extending in narrow bands through petals. Remarkably resistant to full sun for such a dark color.

Paul Ithrig (F-51-3). Evergreen, vigorous grower, four foot flowering stems, re-current bloomer; very large flower, well open, wide sepals and petals which are somewhat re-curved; flower color close to Champagne of Standard Color Card and is decidedly a pastel; throat greenish gold; narrow cream lines extend through the sepals and petals. Stands full Florida sun all day.

Tom Thumb (H-29-1). Definitely a dwarf under best cultural treatment; semi-deciduous; foliage very narrow and 6 inches to 8 inches in length; flowering stems numerous and 6 inches to 8 inches tall; flowers small and cardinal red.

Introduced by William T. Wood, Merriewoode, Macon, Ga.

Merriewoode Star; bicolor, yellow sepals and throat, balance of petals a lovely pink.

HYBRID AMARYLLIS CLONES

Introduced by Ralph W. Wheeler, Winter Park, Fla.

Queen of Sheba. First Prize in its Class; First Class Certificate; Best Flower in the Show—Southeastern Show of the American Amaryllis Society, 1942. Leopoldi, Type A; large flower with wide, well rounded sepals and petals and of good Dutch form; salmon red shading to much deeper tones in the throat, which is satiny and clean in color.



Harry L. Stinson, Seattle, Washington

Bomarea campaniflora

4. CYTOLOGY, GENETICS AND BREEDING

ALSTROEMERID BREEDING POSSIBILITIES

HARRY L. STINSON, *Washington*

Very few if any serious efforts have been made to hybridise the various species of *Alstroemeria* or *Bomarea*, and what hybrids are mentioned in the literature have been the result of accidental rather than deliberate attempts to secure desirable crosses. Possibly one reason for this is the fact that it has been only in the last few years that a sufficient number of species have been available for hybridization, and these in widely separated sections of the country. Another reason might be that they had never been brought to the attention of any one who might have the time and facilities to carry on a serious line of extensive experiments, although in one reference I did find that they had been used in laboratory work in the study of chromosomes. Now that more species are available and a deepening interest is being shown in them, it would seem that they offer a fertile field for the plant hybridizer.

From recent reports I have been given the impression that Messrs. Brydon and Hannibal have been experimenting to develop some special characteristics in some of their favorite plants. How successful these have been I have not heard.

Personally I have done little along these lines as I simply do not have the necessary time which would be required to do it properly. The coloring of *Alstroemeria psittacina* (*pulchella*, in the trade) at one time intrigued me to try to see if it could be hybridised with some species which would make the flowers more open and show the coloring to a better advantage. With this in view I crossed six plants with *A. chilensis* and the same number with *A. pelegrima* var. *alba*. They set seed and germinated but to-date they have not shown the desired results. Further crossing of the hybrids may eventually produce something worthwhile. Several times I have tried to self-pollinate *Bomarea campanulata* (Plate 228) and *Alstroemeria nemorosa* but with no results. This last year they were left alone and both set a couple seed pods and several seedlings are coming along nicely.

In the field the varieties of *A. aurantiaca* show the effects of cross pollination with one another but no evidence has been observed of crossing with *A. chilensis* which is growing adjacent to them. Likewise, *A. pulchra* shows no indications of being affected by the pollen of any of the other species. Seedlings selected from certain desired colors have the tendency to come about 90 per cent true to the parent color without resorting to hand pollination.

The bomareas seem to set seed quite readily, but I have not been successful in getting them to germinate. Possibly they are sterile as I have been fairly fortunate in getting imported *Bomarea* seed to germinate.

SUMMARY OF WORK ON CYTOLOGY OF NARCISSUS L.*

PROF. DR. ABILIO FERNANDES

Faculty of Sciences, University of Coimbra, Portugal

The more important results of my research in the genus *Narcissus* L. concerns the following questions:

I—THE NUMBER AND FORM OF THE CHROMOSOMES

During my research, I have established the number and chromosome formula of the following species:

[*Translators note*—Dr. Fernandes uses the customary cytological short hand to describe the idiograms (chromosome complements) of the various species of *Narcissus*. This system indicates the relative length of the chromosome and approximate position of the centromere. The initials L, M and P are taken from the Latin words, *longus* (long), *medius* (medium) and *parvus* (short), to which Dr. Fernandes has added the intermediate types l and i; m; and p. An apostrophe indicates the satellite chromosome.—*Thomas W. Whitaker*].

<i>Narcissus scaberulus</i> Henriq.	14	2:LL + 2:Ll + 2:Lm + 2:Lp + 2:li + 2:lp + 2:Pp'
<i>Narcissus calcicola</i> Mend.	14	Ditto
<i>Narcissus rupicola</i> Duf.	14	Ditto
<i>Narcissus Watieri</i> Maire	14	Ditto
<i>Narcissus juncifolius</i> Lag.	14	6:Lp + 2:lm + 2:mP + 2:PP + 2:Pp'
<i>Narcissus dubius</i> Gouan	50	2:Lp + 4:L. + 2:lm + 2:l. + 4:P.' + 2:pp + 6:p. + 12:Lp + 4:lm + 4:mP + 4:PP + 4:Pp'
<i>Narcissus gaditanus</i> boiss. et Reut.	14	2:Lm + 2:Lp + 2:Lp + 2:Lp' + 2:li + 2:Pp + 2:P.
ssp. <i>minutiflorus</i> (Willk.)	14	Ditto
<i>Narcissus Jonquilla</i> L.		
var. <i>Henriquesi</i> Samp.	14	2:Ll + 2:Ll + 2:Lm + 2:Lp + 2:li + 2:lp + 2:lp'
Simple odorante	14	Ditto
Double odorante	14	Ditto
<i>Narcissus jonquilloides</i> Willk.	21	14 <i>Jonquilla</i> + 7 <i>gaditanus</i>
<i>Narcissus viridiflorus</i> Schousb.	28	4:Ll + 4:Ll + 4:Lm + 4:Lp + 4:li + 4:lp + 4:lp'
<i>Narcissus intermedius</i> Lois.	17	1:LL + 4:Lm + 6:Lp + 1:lm + 1:lp + 1:P.' + 3:p.

* The original was written in the French Language. The Society is indebted to the eminent scientist, Dr. Thomas W. Whitaker, La Jolla, California, for the very excellent English translation. The original manuscript in the French Language has been deposited in the United States Department of Agriculture Library Washington, D. C., where students may consult it.—Ed.

<i>Narcissus Tazetta</i> L. var.?	20	4 :Lp + 4 :L. + 2 :lm + 2 :lp + 2 : P.' + 6 :p.
Almalguez	21	4 :L. + 2 :lm + 2 :lp + 2 :l. + 4 : P.' + 1 :pp + 6 :p.
Narcisse à bouquet totus albus	22	2 :Lp + 4 :L. + 2 :lm + 2 :l. + 4 : P.' + 2 :pp + 6 :p.
Narcisse à bouquet totus albus grandiflorus	22	Ditto
Cêrca do Convento de Mafra Jardim da Quinta das Varandas, Coimbra	22 30	Ditto
<i>Narcissus Panizzianus</i> Parl.	22	2 :Lp + 4 :L. + 2 :lm + 2 :l. + 4 : P.' + 2 :pp + 6 :p.
<i>Narcissus papyraceus</i> Ker	22	Ditto
<i>Narcissus pachybolbos</i> Durieu	22	Ditto
<i>Narcissus polyanthos</i> Lois.	22	Ditto
<i>Narcissus biflorus</i> Curt.	17	
<i>Narcissus Broussonetti</i> Lag.	22	2 :Lp + 4 :L. + 2 :Ll + 2 :l. + 2 : P.' + 2 :P. + 2 :pp + 6 :p.
<i>Narcissus elegans</i> Spach ssp. <i>intermedius</i> (Gay) F.Q.	20	6 :Lp + 4 :L. + 2 :lm + 2 :P.' + 4 : P. + 2 :p.
var. <i>fallax</i> F.Q.	20	6 :Lp + 4 :L. + 2 :P.' + 4 :P. + 2 : p. + 2 :pp
<i>Narcissus serotinus</i> L.	30	4 :LL + 4 :Lp + 2 :Lp + 2 :L. + 4 :li + 4 :lp + 2 :P.' + 2 :P. + 6 :p.
<i>Narcissus triandrus</i> L.	14	6 :Lp + 2 :lm + 2 :PP + 2 :Pp + 2 :Pp'
<i>Narcissus reflexus</i> Brot.	14	Ditto
<i>Narcissus Bulbocodium</i> L. x N. <i>reflexus</i> Brot.	14	
<i>Narcissus Pseudo-Narcissus</i> L.	14	4 :Lp + 2 :Lm + 2 :li + 2 :lp + 2 : Pp + 2 :Pp'
var.?	14	4 :Lp + 2 :Lm + 2 :li + 2 :lp + 1 : lm + 2 :Pp + 1 :Pp'
var. <i>bicolor</i> (L.)	28	8 :Lp + 4 :Lm + 4 :li + 4 :lp + 4 : Pp + 4 :Pp'
<i>Narcissus incomparabilis</i> Mill.	14	6 :Ll + 3 :Lp + 1 :li + 1 :lp + 1 : Pp + 2 :Pp'
<i>Narcissus odorus</i> L.	14	
<i>Narcissus asturiensis</i> Pugsley	14	8 :Lp + 2 :lm + 4 :PP
<i>Narcissus cyclamineus</i> DC.	14	4 :Lp + 2 :Lm + 2 :li + 2 :lp + 2 : Pp + 2 :Pp'
<i>Narcissus Pseudo-Narcissus</i> L. x N. <i>cyclamineus</i> DC.	14	4 :Lp + 2 :Lm + 2 :li + 2 :lp + 2 : Pp + 2 :Pp

Narcissus Bulbocodium L.

var. <i>genuinus</i>	14	6 :Lp + 2 :lm + 4 :PP + 2 :Pp.
ssp. <i>nivalis</i> (Grlls.)	14	Ditto
Vimeiro	14	4 :Lp + 2 :Lp + 2 :lm + 4 :PP + 2Pp'
Leca do Bailio	21	
Redinha	28	12 :Lp + 4 :lm + 8 :PP + 4 :Pp'
Chiqueda	27	2 :Ll + 8 :Lp + 2 :Lp + 2 :lm + 8 :PP + 2 :Pp + 2 :P. + 1 :p.
Chiqueda	26	2 :Ll + 8 :Lp + 2 :Lp + 2 :lm + 8 :PP + 2 :Pp + 2 :P.
Mira de Aire	26	Ditto
Pinhal do Valado	26	Ditto
S. Martinho do Porto	26	Ditto
Foz do Arelho	26	Ditto
Tapada da Ajuda	26	Ditto
Parede	26	Ditto
Raposeira	26	2 :Ll + 8 :Lp + 2 :Lp + 2 :lm + 8 :PP + 2 :Pp + 2 :P.
Pontal	26	Ditto
Pinhal de Leiria	35	15 :Lp + 5 :lm + 10 :PP + 5 :Pp
Povoa de Lanhoso	42	18 :Lp + 6 :lm + 12 :PP + 6 :Pp

II—RELATIONS BETWEEN CYTOLOGY AND SYSTEMATICS

A comparative study of the idiograms shows that in general the degree of resemblance of the chromosome garniture parallels the degree of resemblance of the external morphological characters. In certain cases, I have verified the idea that cytology indicates the relationship between species whose similarities from the point of view of external morphology have been perceived by the taxonomists. A careful study of the external morphology of these species reveals, in a sufficiently clear fashion, the existence of these similarities. Among cases of this type, one can cite the following:

1. In a study of the group *Jonquilla* (in the sense of Bowles), I have found that the species of this group can be divided into three sub-groups, each of which have a different karyotype. A study of the morphological characters shows that the same three sub-groups can be formulated:

A—*N. scaberulus* Henriq., *N. calcicola* Mend., *N. rupicola* Duf. and *N. Watieri* Maire.

B—*N. juncifolius* Lag. and *N. gaditanus* Boiss. and Reut.

C—*N. Jonquilla* L. and *N. jonquilloides* Willk.

2—*N. elegans* Spach has been included by several authors in the section *Autumnales* Gay. The cytological evidence, in contrast, has shown that its idiogram has a great many analogies with that of *N. Tazetta* L. in the section *Hermione* (Salisb.) Spreng. After obtaining this evidence the external morphological characters have contributed evidence to show the justification for this point of view.

3—*N. viridiflorus* Schousb. has also been considered as belonging to the section *Autumnales* Gay. Its idiogram shows a clear relationship with those of the section *Jonquillae* Parl. The same similarities have been discovered by a study of its external morphology and, consequently, this species must be placed in the section *Jonquillae* Parl.

These facts show, therefore, in the genus *Narcissus*, there is in general a rather clear parallelism between the characters of the idiograms, and those of external morphology, and that as a result, the cytological data can be used to serve, in connection with other characters (morphology, anatomy, physiology, ecology and geographic distribution), to bring to a focus questions of systematics, especially when one knows the processes which are active in the evolution of these groups.

Once this conclusion has been acquired and tested, we have succeeded in solving some doubtful questions concerned particularly with the delimitation of certain species, the systematic position of others, the relationship between sections and sub-genera, etc.

Assuming that the comparative study of idiograms can contribute a very appreciable amount of information concerning those processes by means of which species are differentiated, we have succeeded, based on cytological characters, and on the facts of external morphology and geographic distribution, in elaborating a phylogenetic classification of the genus, which is almost on the point of being published.

III—CYTOLOGY AND THE PROBLEM OF EVOLUTION

The problems for which the data of comparative cytology can furnish a solution are most significant for evolution and for the establishment of phylogenetic relationships.

With the genus *Narcissus*, evolution frequently affects the form and number of the chromosomes. In considering the genus as a whole, one can say that the processes which have been active, and are still active in its evolution are the following:

- (a) Mutation of genes
- (b) Hybridization
- (c) Loss of chromosomes
- (d) Polyploidy
- (e) Chromosome alterations (fusion, fragmentation, translocation, deficiency, inversions and reduplication)

It is important to note that in general these processes do not act separately, but can be combined in any way, thus making the evolutionary process extremely complex.

In certain cases, it has been possible to reconstruct, with precision, the processes by means of which certain species have been produced. Thus:

- (a) Gene mutations (alone or associated with chromosome alterations, not demonstrable by cytological methods).

1. Differentiation of *N. asturiensis* Pugsley and *N. cyclamineus* DC. originating perhaps from *N. Pseudo-Narcissus* L.

2. Origin of *N. reflexus* Brot. starting from *N. triandrus* L., where these two species originated from a common ancestor.

3. Differentiation of *N. scaberulus* Henriq., *N. calcicola* Mend., *N. rupicola* Duf. and *N. Watieri* Maire starting from a primitive species probably similar to *N. scaberulus* Henriq.

(b) Polyploidy.

Origin of polyploid forms of *N. Bulbocodium* L. (3b, 4b, 5b and 6b), *N. Pseudo-Narcissus* L. (3b and 4b), *N. Tazetta* L. (3b) and *N. poeticus* (3b).

(c) Hybridization of species.

1. *N. odoratus* L. = *N. Pseudo-Narcissus* L. x *N. Jonquilla* L.

2. *N. biflorus* Curt. = *N. Tazetta* L. x *N. poeticus* L.

3. *N. intermedius* Lois. = *N. Tazetta* L. x *N. Jonquilla* L.

4. *N. gracilis* Sabine = *N. Jonquilla* L. x *N. poeticus* L.

(d) Polyploidy + hybridization of species.

N. Jonquilla L. ($b=7$) produces tetraploid forms ($4b=28$). By means of crossing the gametes of one of these forms ($n=14$) with the haploid gametes of *N. gaditanus* Boiss. and Reut. ($n=7$), *N. jonquilloides* Willk. ($2n=21$) originated.

This case is remarkable, since the data of external morphology, in demonstrating the characters which permit distinction of *N. jonquilloides* Willk. and *N. Jonquilla* L.; either represent intermediate conditions between *N. gaditanus* Boiss. and Reut. and *N. Jonquilla* L.; or else correspond to the characters of *N. gaditanus* Boiss. and Reut.—are completely in accord with idea proposed for the origin of *N. jonquilloides* Willk. In addition, it has been possible, to utilize the facts of geographic distribution and time of flowering, to establish that these species were produced recently, in the interior of an area delimited by a line passing through Cadiz, Sanlucar de Barrameda, Sevilla, Grazalema, Medina-Sidonia, Cadiz.

(e) Polyploidy + hybridization of species + chromosome duplication.

N. juncifolius Lag. ($b=7$) produces some tetraploids ($4b=28$). As a result of conjugation of the gametes of one of these plants ($n=14$) with the haploid gametes of *N. Tazetta* L. ($n=11$), forms with $2n=25$ have been produced, which, by chromosome duplication has give rise to *N. dubius* Gouan ($2n=50$).

It is probable that this species was produced in the southern part of the Province of Catalonia (Spain) and that, in this region it spread first towards the north and then towards the east.

(f) Chromosome alterations.

1. Differentiation of *N. Jonquilla* L. and *N. juncifolius* Lag. from a primitive ancestral species.
2. Differentiation of *N. gatitanus* Boiss. and Reut. from *N. juncifolius* Lag.
3. Origin of several races of *N. Bulbocodium* L., *N. triandrus* L., *N. reflexus* Brot and *N. Tazetta* L.

(g) Polyploidy—chromosome alteration (reciprocal translocations—elimination of chromosomes).

1. Differentiation of *N. Bulbocodium* L. var. *obesus* (Salisb.).
2. Origin of forms of *N. Tazetta* L. with 20 somatic chromosomes.

(h) Secondary polyploidy + chromosome alterations.

1. Differentiation of forms of *N. Tazetta* L. with $2n = 22$.
2. Origin of *N. Broussonetti* Lag.
3. Differentiation of *N. serotinus* L. ($30 = 4b-2$).

IV—POLYPLOID FORMS IN THEIR RELATION WITH ECOLOGY

Studies pursued with *N. Bulbocodium* L. have shown that diploids cannot live in acid soils (p. H. values between 3.7 and 6.2), while the forms with $2n-26$ (hypotetraploides) can grow on soils of moderate acidity, and on neutral and alkaline ones (pH values between 5.7 and 7.8). The polyploids represent therefore, in comparison with their respective deploids, a new physiological equilibrium which is related to the concentration of the hydrogen ion of the soil. In this manner, polyploids, besides constituting material for the differentiation of species, are of extreme importance for the survival of species, because it permits them to enlarge their areas by the conquest of regions where diploids cannot prosper.

V—POLYPLOIDY AND SIZE OF THE INDIVIDUAL

In the polyploid series found in *N. Bulbocodium* L. ($2b$, $3b$, $4b$, $5b$ and $6b$), one notes that there is not a consistent relation between the degree of polyploidy and the size of the individuals. In spite of a statement of the existence of a progressive augmentation of the diploids up to the pentaploids, a hexaploid form has been found in which the height is less than those of diploid individuals. To explain this fact, Muntzing assumes that the number $6b$ passes the optimum chromatin content, beyond which the individuals become less vigorous or even inviable. Some unpublished research, shows that within the degree of polyploidy $6b$, the plants appear to differ considerably one from the other from the point of view of their height. For this reason, it is probable that the appearance of a hexaploid with small dimensions is due to the fact that it has been derived from a diploid race homozygous for factors of dwarfism.

One can therefore conclude, that although the existence of a chromatin variable according to the organism is probable, the height of polyploids not only depends upon the increase in the number of chromosomes, but depends also on the genes which condition development.

VI—MIXOPLOIDY

This phenomena, evident in the root tips of *N. reflexus* Brot., originates by means of the fusion of the diploid nuclei of two neighboring cells, after the absorption of the wall which separates them.

It is not probable that this process of chromosome duplication plays as important a role as those which are concerned in the establishment of polyploid forms in *Narcissus*. It is more probable that polyploids are produced by the fusion of polyploid gametes formed as a result of anomalies that frequently take place during the reduction divisions.

VII—SIGNIFICANCE OF SATELLITES AND THEIR EVOLUTION DURING MITOSIS

The satellites represent nucleologenic regions (nucleolar-organizing bodies of McClintock), that is to say, these regions depend upon the nucleolar material which condenses during telophase.

There are two categories of satellities: heterochromatic and euchromatic. The first represents, either regions that are completely nucleologenic (holosatelites), or else the more or less larger parts of these regions (merosatelites). The latter are the euchromatic portions of the chromosomes, separated from the nucleologenic region by means of a filament produced as a result of growth of the nucleolus.

In 1936, I have verified, in opposition to a firmly held belief, that the satellite filament stains with aceto-carmin. As it was necessary to wait some time to accumulate the results obtained by the use of this stain, I recorded my observations the following year, before knowing of the work of Schaede (1936, 1937), that the filament is sensitive to the Feulgen nucleal reaction and that, in consequence, it represents a part of the chromonema distended under the action of the developing nucleolus.

Having proven that the satellite filament exhibits a positive reaction, indicative of the presence of thymonucleic acid, the expression SAT-chromosome (Sine Acido Thymonucleinico), from Heitz, should be substituted for that of nucleolar chromosome.

In the root tips of *N. reflexus* Brot. and *N. triandrus* L. variations in the length of the satellites have been discovered. These results have been questioned by Gates, who attributes these variations to intensity of staining. Other investigators among whom are some of Gates' students have, however, verified the existence of this phenomena, not only in species of the genus *Narcissus* (Sikka, 1940) but also in other material (Sato, 1937; Mensinkai, 1939; Pathak, 1940).

Variation in the dimension of the satellite has been attributed, either to translocations, or to variation in the position of the point of greatest activity of the nucleogenic region, or to these phenomena acting together.

During interphase and almost all of prophase, the satellites are found on the surface of the nucleoli and are joined to their respective chromosome by means of a satellite filament, it also is attached to the surface of the nucleolus. More frequently, the nucleolar chromosome remains attached to the nucleolus, until the complete dissolution of this body; sometimes, however, liberation takes place before the complete dissolution of the nucleolus.

VIII—POLYPLOIDY AND NUCLEOLAR CHROMOSOMES

Based on the principle that diploid organisms (both plants and animals) possess in their chromosome set a single pair of nucleolar chromosomes, Gates vigorously insists on the value that must be attributed to the number of chromosomes of this type (where the number corresponds to the nucleoli) in that it indicates a polyploid origin, and the degree of polyploidy of certain species. Some observations have shown, although, quite frequently these data lead to precise results, one should be extremely cautious in their application, for the following reasons:

- a) Failure of the generality of the principle that all monoploid genomes possess a single nucleolar chromosome.
- b) The possibility of the existence, among diploid individuals of the same species, of variability in the number of nucleolar chromosomes.
- c) The possibility of the appearance of structural alterations in the genomes of polyploids which would increase or diminish the number of nucleolar chromosomes.
- d) The possibility of the appearance in polyploids of the phenomena of amphiplasty. Its occurrence must be particularly frequent in allopolyploids.

IX—THE NUMBER OF “CHROMONEMATA” IN MITOTIC CHROMOSOMES

A study of the mitotic behavior of a heterochromatic chromosome found in a plant of *N. juncifolius* Lag., shows in a sufficiently clear fashion, that at anaphase and interphase this chromosome has two chromonemata.

POLLEN GERMINATION AND TUBE GROWTH IN *MILLA* AS AFFECTED BY PURE GROWTH SUBSTANCES¹

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The germination of pollen and the growth of the pollen tube is of considerable general and practical interest to plant breeders, geneticists

¹ Report of work carried out with the assistance of a Grant-in-Aid from the Society of Sigma Xi. The investigator is indebted to Mr. W. M. James and Mr. A. B. Lytel of Las Positas Nursery for the flowers of *Milla biflora* employed in the experiments.

and cytologists as well as to plant physiologists. Any of the above types of workers may have occasion to germinate or culture pollen artificially. Hence it was felt that many of the readers of HERBERTIA might find the results of the following experiments of interest. This paper outlines a technic employed in the germination of *Milla* pollen and presents the principal results of experiments testing the effects of 33 pure growth substances on the germination and growth of the pollen tubes of this Genus.

A number of methods of germinating pollen have been used by various investigators. The media employed have been of two principal types, those involving agar or gelatin and those using only liquid. A liquid medium was selected for these experiments because it permitted more ready observation of the pollen tubes during the period of growth. Eight drops of medium were placed on the under side of the cover of a Petri dish. They were measured by means of a fine pipette to give an average volume of 0.005 ml. per drop. About 1 ml. of distilled water was placed in the bottom of each dish to give a saturated atmosphere.

The basic medium contained water double distilled from pyrex glass, Hoagland and Arnon's Nutrient Salt Solution I (Univ. Calif. Exp. Sta. Circular 347. 1939) in which the boric acid content had been raised to 0.01%, and 12% glucose. The salt solution may not be essential. Many workers have cultured pollen in media containing only sugar and agar or gelatin. However it was used because it contained all the known inorganic chemicals required for plant growth. The relatively high boron concentration is known to be required by the pollen of many species of plants and was essential to *Milla*. The glucose concentration was the optimum tested of several concentrations of sucrose, fructose, glucose and glycerol. The pure substances were added to this basic or "control" medium in five concentrations to determine if they were capable of increasing germination or tube growth.

From 15 to 30 pollen grains were placed in each drop of medium. The size of the drop and the amount of inoculum were kept as constant as possible because it was noted that pollen tube growth was increased when the number of grains was very high in proportion to the amount of medium. Since this phenomenon was presumably due to a diffusible chemical, the inoculum was kept very low so that the chemical would be detected if it were among those added to the medium. At the end of two hours all growth had ceased and the results were recorded. The cultures were kept as close to 25° C as possible during the experimental period.

Results were taken in the form of the percentage of germination and the average length of the pollen tubes in each concentration tested. The averages for each substance were compared with the corresponding controls. A statistical analysis was performed to determine how great a difference was necessary to indicate a significant increase over the controls. Table I lists the pure substances tested and shows which were effective in promoting germination or pollen tube growth.

TABLE I

A SUMMARY OF THE PURE SUBSTANCES TESTED ON THE GERMINATION AND GROWTH OF MILLA POLLEN TUBES, AND THEIR ACTIVITY

Substances	Most Effective Concentration		Activity	
			Germination Percent	Tube Length
Water Soluble Vitamins:				
Thiamin #		—	—	—
Niacin #		—	—	—
Niacinamide #		—	—	—
Riboflavin	0.1	mg./liter	—	*
para-aminobenzoic acid	1.0	mgl/liter	*	*
Inositol	16	mg./liter	*	—
Pyridoxin #	0.01	mg./liter	—	*
Ascorbic acid		—	—	—
Ca-pantothenate	0.01	mg./liter	—	*
alpha-naphthyl acetamide		—	—	—
Oil Soluble Vitamins:				
2-methyl-1, 4-naphthoquinone		—	—	—
alpha-tocopherol		—	—	—
Plant Hormones:				
Indole-acetic acid	0.1	mg./liter	—	*
Traumatic acid		—	—	—
Animal Hormones:				
Estrone		—	—	—
Pyrimidines and Purines:				
Uric acid		—	—	—
Adenine		—	—	—
Xanthine		—	—	—
Guanine	0.001	Saturated	—	*
Thymine	0.1	mg./liter	—	*
Cytosine		—	—	—
Uracil	1.0	mg./liter	*	—
2-methyl-4, 6-dihydroxypurine		—	—	—
2-methyl-4-hydroxy-5-hydroxy-methylpurine		—	—	—
2-methyl-4-amino-5-thioformamidomethylpurine	0.1	mg./liter	—	*
4-methyl-5-hydroxymethyluracil		—	—	—
2-methyl-4-hydroxy-5-amino-methylpurine-hydrochloride	100	mg./liter	—	*
2-methyl-4-amino-5-amino-methylpurine-hydrochloride	1.0	mg./liter	—	*
Miscellaneous Compounds:				
Pimelic acid		—	—	—
Allantoin		—	—	—
Alloxan		—	—	—
2-chloroisothiamin-iodide	1.0	mg./liter	—	*
Acenaphthene	0.01	Saturated	*	*

These substances may also be classified as plant hormones.
* Activity sufficiently above the controls to have statistical significance.



Josephine Henry, Gladwyne, Penna.

See page 138.

Henry hybrid Cyrtanthus—C. MacKenii X C. parviflorus—in 7 inch pot, under 2 years old.

Plate 229

It may be of interest to note that several physiological types of substances are active. These include vitamins, plant hormones, and the pyrimidines and purines. The latter are important chemical building blocks in cell structures, particularly the nucleus. The fact that there are so many active substances might suggest that a combination of them would lead to very active growth of the pollen tube. Unfortunately this was not the case. Two combinations of the most likely substances when incorporated in the medium did not increase germination or tube growth beyond that of the more favorable single substances. Stigma exudate, however, had a very potent effect upon the pollen. This viscous liquid, which is produced upon the open stigma under humid conditions, supported a tube growth of about twice as much as in the most favorable synthetic medium. Presumably it contains some chemical factor(s), yet to be discovered, which is responsible for its effectiveness. A search for this factor(s) is now underway and it is hoped that its discovery will lead to a more complete understanding of the physiology of pollen tube growth.

CYRTANTHUS IN THE LITTLE GREENHOUSE

MARY G. HENRY, *Gladwyne, Penna.*

Surely there are others who, like myself, enjoy mid-winter gardening in a tiny greenhouse.

For those who prefer working in an out-of-doors garden, underglass work is but a poor substitute. Nevertheless in winter in our part of the world, it is gardening indoors or no gardening at all.

Among the most popular of South American flowers are the large flowered hybrid *Amaryllis*. Most of us have seen and admired the beautiful new creations raised by hybridizers. The colors are exquisite and the symmetry leaves nothing to be desired. They are indeed marvels of perfection. Nevertheless the luxuriant leaf growth of these handsome plants is far too bulky for a tiny greenhouse. A few of them in mine would leave room for little else.

Cyrtanthus, miniature amaryllids from South Africa, are pleasing and entirely satisfying substitutes, to my way of thinking, and they have a wider range of coloring, for in addition to reds, pinks and whites, there are excellent yellows and creams.

The first *Cyrtanthus* that came into my possession years ago was *C. parviflorus*. The flowers of this species are small but are colored a fine red. *C. lutescens*, which bears yellow or cream flowers and *C. Mackenii*, pure white, were my next additions. Then I received from the United States Department of Agriculture a plant numbered 78510 "*Cyrtanthus* sp. received under the name '*Flammeus*' ". This latter bears flowers of a very pretty shade of deep pink.

My first batch of seedlings were raised from this one. It was an agreeable surprise to find how quickly the seeds germinated, and how fast the little bulbs developed and came into bloom. *C. "flammeus"* is evidently a hybrid for scarcely any of the seedlings were alike and none was as good as the parent. These bulbs have all been discarded but they

gave me an idea, so I proceeded to cross the species. The results have been most gratifying and more than repaid the small outlay of time and trouble expended.

The first cross I made was *C. Mackenii* X *C. parviflorus*. The seed pods matured in quick order. Seeds planted January 25th, 1940 germinated in five days, which seems to be the usual time for fresh *Cyrtanthus* seeds. The resulting bulbs began to bloom April 2d, 1941, just fourteen months and one week from date they were sown.

The flowers came in many utterly delightful shades, mostly in coral and sea shell colorings, along with whites and reds. Only two of this lot were sufficiently attractive to segregate for vegetative propagation. (See Plate 229.)

Cyrtanthus Mackenii x *Cyrtanthus lutescens* was my next cross. *C. lutescens* has lately been designated as *C. Mackenii* var. *Cooperi*, but it is still commonly listed as *C. lutescens*. I planted these seeds March 10th, 1940 and they began to bloom May 18th, 1941. As was to be expected, the flowers of most of the plants were in various shades of yellow and cream and a few were pure white. Some had yellow buds which opened to ivory white flowers. These seedlings are especially vigorous and several bore flowers that were a great improvement on the parents. A plant with nice sized flowers of daffodil yellow is very pretty; another with comparatively large cream-colored flowers, and broad rounded segments is extremely lovely.

Cyrtanthus lutescens was then crossed with the hybrid *C. "flammeus"*. These seeds were planted March 12th, 1940 and the first one bloomed May 15th, 1941. There is a great variety of color and form in this group of seedlings. The best ones are colored deep crimson pink with fairly large well shaped flowers, but some of the creamy pinks and apricot yellows are very lovely and strange to say, the best white *Cyrtanthus* comes from this lot.

The flowers of the foregoing hybrid *Cyrtanthus* are all attractive. There is not an "ugly" in the lot. Naturally some are very much finer than others. It has indeed given me keen pleasure to evaluate and tag the best ones for propagation later on.

It is an added charm that the leaves of these *Cyrtanthus* are evergreen and although these little bulbs never require a real drying off, they do bloom more freely if they are kept "on the dry side" for a while during the summer if autumn flowers are desired or during autumn when flowers are wanted for the winter season.

The soil in which I plant the seeds is a mixture composed of about two-thirds sand and one-third New Jersey peat with a little crushed charcoal added if I happen to have it or a small amount of cinders.

The first repotting for the little seedlings comes when the bulblets have two or three leaves. At this time they require a richer soil. The mixture I use is one-third peat, one-third forest soil and one-third coarse sand. For blooming sized bulbs very old cow manure can be added with advantage. My bulbs are repotted whenever I can find time to do so. They are very tractible and if kept on the dry side for a few days, soon become established.

They are fast growers and produce offsets very freely. Plants less than two years old frequently produce a dozen offsets. If planted singly, these accommodating bulbs can remain in three inch pots until their first flower stalk has faded. Six to eight can be flowered in a five inch pot or nine to twelve in a six inch pot. They seem to do best when top dressed or preferably repotted every season. However, in the matter of repotting, they will stand considerable neglect, and will often bloom under adverse conditions.

The simplest method of obtaining a good display of *Cyrtanthus* is to plant the seeds fairly closely and evenly in the pots in which they are to bloom. A seven inch pot containing 16 to 20 seeds can be kept grow-



Fig. 77. Flower of *Cyrtanthus sanguineus*. Photo by Josephine Henry, Gladwyne, Pa.

ing for about twenty months. A slight drying off at this time will cause the entire lot to bloom simultaneously, preferably in February.

Many of the bulbs will throw several flower stalks and the pot will remain a delightful ornament for a surprisingly long time, three weeks or more.

Grown in this manner, the roots of course become badly matted, so the bulbs should be separated and repotted immediately after blooming. Much of the foliage should be removed at this period. During the midsummer season I give my plants some shade.

Their compact habit of growth, their stiff stems that require no support, their neat evergreen foliage and above all their exquisitely lovely flowers, not to forget the ease with which they may be grown, are all golden qualities and few plants possess so many valuable traits.

Cyrtanthus are indeed among the choicest winter-flowering plants that I have ever grown in my tiny greenhouse during an experience of over twenty years, and I know of few more attractive objects than a small turquoise vase with a handful of stalks of *Cyrtanthus* in their various shades of peaches and cream.

CYRTANTHUS SANGUINEUS

The beautiful amaryllid that is called "The Inanda Lily" according to Miss K. Stanford, is undoubtedly one of the handsomest and one of the showiest members of the Genus *Cyrtanthus*. To a casual observer the single-flowered stem and large spreading corolla of *Cyrtanthus sanguineus* (Fig. 77) does not bear a close resemblance to the commoner members of the family. In fact to my mind it seems more like a small *Amaryllis*. In any case, no matter what the name, it is an ornamental and highly desirable bulbous plant for the small mixed greenhouse of an amateur gardner.

On December 7, 1937, I planted fifteen seeds with keen interest and with great care. On the 31st, their slim green spears had pierced the surface. The first one bloomed July 25, 1940. Eleven of the fifteen seeds grew and reached maturity. Unlike the usual types of *Cyrtanthus* which produce a nice sheaf, *C. sanguineus* produces but one to three leaves. With me it seems to be a summer bloomer and I do not know if this is the common habit of this plant or not.

The very beautiful flowers are a full deep rich pink; matched with Ridgway's, they come close to "Rose doree". They are 2¾ inches long and the corolla has a spread of two inches across. The pollen is bright yellow. The flowers last about a week in bloom.

Anyone who has a fondness for members of the Amaryllis Family, should surely make an effort to obtain this choice plant, for truly it is a "gem of the first water".

RECENT TRENDS IN DAFFODIL BREEDING

JAN DE GRAAFF, *Oregon*

PART I

A careful survey of the new daffodils introduced during the past few years will reveal that in England, Australia and even in this country a very definite preference is developing for certain characteristics in the flowers at the expense of others. As a daffodil breeder of some experience, not only in the field of raising new varieties, but also in the field of introducing them commercially and distributing them to the public, I am not altogether happy about the standards set or strived for in new daffodils by most hybridizers.

We may well pause a minute and ask ourselves whether it is right to set up certain standards to please only the few very advanced amateurs and the very few commercial daffodil growers who are interested in new daffodils and to lose sight completely of the fact that new daffodils such as we are raising today are primarily destined to reach the public at large. It seems to me that one of the most important considerations in the selection of new flowers and in the standards set for this selection should be whether the flower is attractive to the average amateur gardener and whether it can be used to good advantage both for garden decoration and as a cut flower for arrangements in bowls and vases. To all of us hybridizers it should be the crowning glory of our work to see one's flowers generally accepted by the public and gladdening the heart of even the poorest gardener.

Let me cite an example of what I have in mind. We grow in our nurseries a very nice stock of *N. Incomparabilis*, *Fortune's Bowl*, a variety which according to prevailing standards rates very high. While I will gladly concede that *Fortune's Bowl* is a fine flower for garden decoration and that it is a superb show flower, it is much too stiff and formal to be used to good advantage as a cut flower in informal arrangements. On the other hand, we recently obtained some fine English hybrids of *N. jonquilla* such as *Hesla* and *Lanarth* which are ideal not only for garden decoration, but also for any type of arrangement in vases or bowls that the amateur gardener might wish to make. In fact, nothing can be prettier than a large bowl filled with flowers of *Hesla* and *Lanarth*, loosely arranged with some contrasting foliage and flowers from spring flowering shrubs.

My point is then whether insistence upon certain characteristics such as smooth overlapping perianth, a short neck, sharply contrasting colors, smoothness of texture, etc., is really justified, knowing as we all do that the public at large cares little about the "show" qualities of their daffodils and probably knows less about our standards than we hybridizers imagine.

I grow a very large collection of the finest English hybrid daffodils. Often we cut some flowers of each variety and put them on display in our warehouse or office. Studying these varieties, which represent the cream of recent introductions, every observer, even the most expert, will be struck by the monotony of their carefully standardized characteristics and will turn with evident relief to some varieties which have charmingly twisted perianths or gracefully drooping flowers.

A great deal of criticism has been leveled at the failure of some recent Dutch introductions to conform with the British standards. A review of the British Horticultural Society Daffodil Yearbooks for the past few years will reveal numerous paragraphs in which the Dutch novelties and even some British (notably the introductions of Mrs. R. O. Backhouse) are dismissed as being too "rough" and too "coarse." One critic, writing in the 1942 Yearbook, disposes of the various Dutch introductions in the Yellow Trumpet division by saying that as a class they are of distinctly less importance for his purposes (breeding), in

that some are quite below par in garden behavior, while others incline too greatly toward coarseness or clumsiness to merit unqualified admiration. He concedes, however, that many of them have exceptional value for forcing.

Now I do not know this critic's standards for garden behavior of daffodils, but I wonder how a variety can have exceptional value for forcing—which means, of course, as cut flowers from forced bulbs—and have no value as cut flowers from garden plantings. There seems to be a contradiction there, since conditions that might bring out good qualities during forcing can be easily duplicated in almost any garden. Such conditions might be growing the daffodils in a shady position so as to obtain a softer color scheme or to have them sheltered from strong winds and hail which can be done quite easily. The point is, however, that these Dutch Yellow Trumpet daffodils perform beautifully in any garden and under any conditions, in fact, we can grow here in Oregon just as perfect flowers outdoors as in the greenhouse, something that cannot be said for many of the new English hybrids. Now it happens that the varieties discussed by this critic are from three different raisers: M. van Waveren & Sons, C. G. van Tubergen, Ltd., and the de Graaff Brothers Co., so that I cannot be accused of having too much of a personal interest in the matter. As a matter of fact, it can be easily shown that the daffodils introduced by these three firms are today playing a leading role in the assortment of daffodils preferred by the public in this country.

The same critic compares White Trumpet *Beersheba* (Engleheart "supreme variety, fully proven, chaste" with White Trumpet *La Vestale* (de Graaff) "hardly so pure and refined", admitting at the same time that *La Vestale* is "a wonderfully good flower for one so plentiful and cheap". *Beersheba* was introduced in 1923 and *La Vestale* in 1927, *Beersheba* sells still at a price of over one dollar each and *La Vestale* is freely available at a fraction of that price. Obviously *La Vestale* is a better propagator and since it is in great demand, it must be a flower that appeals to the public. Evidently a flower that is possibly not so pure and refined but good in the garden as well as for cutting answers the needs of the amateur. Would we then be wise to use in breeding *Beersheba* in preference to *La Vestale* or *Dawson City* "one of the most satisfactory trumpets" to *Diotima* and *Ben Hur* "rough and coarse". I think not.

To me the modern daffodil has but one task to perform. It has to be attractive wherever used. I do not believe that the perfectly geometrically precise symmetry of these new English introductions is of great value, either in the garden or as cut flowers. I certainly do not believe that the production of a race of flowers that can only be used as "show flowers" is of great value to the public. Certainly the American gardening public does not seem to think so since they continue to demand daffodils of more informal habit.

I believe, then, that we have come to a very sharp cleavage between the taste of the British daffodil raisers and their American followers and the taste of the gardening public. It seems pertinent to

ask: "Where are the British daffodil raisers taking us?" To flowers of still greater refinement, of still greater and more perfect symmetry? Surely that cannot be an ideal. It takes the daffodil farther and farther away from what the gardening public expects from it. It leads to such excesses as the building of special shelters for "show" flowers as is done in Ireland (see Daffodil Yearbook 1942, page 13). Frankly I do not consider it a compliment when I hear, as I do so often at daffodil shows, comments such as: "Why, that flower does not look like a daffodil at all." I am inclined to take such remarks as an implied criticism, as an indictment of what, among the "experts", is considered "ideal" form.

I certainly do not want to be an iconoclast and I shall continue quite gratefully to use the so-called "perfect" English introductions as seed and pollen parents for my new daffodils. But, I am fully cognizant of the fact that in doing this I must not merely follow in the tracks of our foreign mentors and adopt their standards of judging and selecting.

Is it not with these new daffodils, so cleverly publicized by our British colleagues, as it is with certain forms of art where refinement brought the art to a stage where it no longer lived? Looking at the "ideal form" of many of Mr. Guy Wilson's and Mr. Lionel Richardson's new daffodils, I cannot help but be reminded of pre-Raphaelite painting at its best. The perfection of these paintings, their delicacy of line and detail and their magnificent coloring are of little but passing interest to us today. At any rate these paintings are now of no importance to the public other than as a transitory phase in the historical development of art. It is my belief that a definite analogy exists between the extreme refinement of our modern daffodils and the refinement of these paintings.

In conclusion I may as well admit that I am very fond of the "perfect" show daffodils and that we, at the Oregon Bulb Farms, are very busy raising a good many seedlings in the British tradition. But we are also trying to produce some daffodils which conform with none of the high standards of geometrical perfection that the British raisers hold of paramount importance in the hope of raising some new varieties which may be "coarse" and "rough" but which will look like daffodils to anyone familiar with Golden Spur, Empress and Sir Watkin.

These new seedlings, the advent of which I impatiently await, will be very large. They will have tall stems, be extremely prolific and disease resistant, have brilliant colors, and will be hardy and strong. But the perianths may be twisting, the trumpet may be widely flaring and deeply imbricated. It may be very hard to fit them nicely into one of the R. H. S. divisions but at least I expect the public to say: "Look at those *Daffodils*!" Rather than, "I did not know a daffodil could look like *THAT*."

PART II

In the foregoing article I have tried to point out that it is essential for the daffodil hybridizer, as it must be for the hybridizers of any plants, to keep in touch with his public. Giving the public not what it

wants, but what it should have, is of value only when there can be no doubt about the standards set by *bona-fide* experts.

Having made these statements it behooves me to state more fully how I arrive at the conclusion that the "perfect" daffodils of the leading British hybridizers have failed to conform to the standards set, for

TABLE I

Medium Priced Narcissus Varieties for the Garden

Class	1913	1942
1a	<i>Emperor</i> (Back.) <i>King Alfred</i> (Kendall, J.)	<i>King Alfred</i> (Kendall, Jr.) <i>Emperor</i> (Back.)
1b	* <i>Madame de Graaff</i> (de Graaff) * <i>Mrs. Betteridge</i> (de Graaff)	<i>Mrs. E. H. Krelage</i> (Krelage-Krelage) <i>La Vestale</i> (de Graaff)
1c	* <i>Empress</i> (Back.) * <i>Weardale Perfection</i> (Back.)	<i>Spring Glory</i> (de Groot) <i>Victoria</i> (van Veen, J. H.)
2	<i>Gloria Mundi</i> (Back.) * <i>Homespun</i> (Engle) * <i>Lady M. Boscawen</i> (Engle.) * <i>Lucifer</i> (Lawrenson, Mrs.) <i>Croesus</i> (Will, J. C.)	<i>Croesus</i> (Will, J. C.) <i>John Evelyn</i> (Cope.) <i>Francisca Drake</i> (Back., Mrs.)—de Graaff <i>Yellow Poppy</i> (Cart. & Good) <i>Helios</i> (Engle.)
3	<i>Barrii conspicuus</i> (Back.) * <i>Albatross</i> (Engle.) * <i>Southern Star</i> (Engle.) * <i>Firebrand</i> (Engle.) <i>Brilliancy</i> (Engle.)	<i>Diana Kasner</i> (Back., Mrs.)—de Graaff <i>Bath's Flame</i> (Engle.)—Bath <i>Alcida</i> (Back., Mrs.) <i>Firetail</i> (Cros.) <i>Shackleton</i> (v. Tub.)
4	<i>White Lady</i> (Engle.) * <i>Duchess of Westminster</i> (Back.) * <i>Ariadne</i> (Engle.) * <i>Empire</i> (Cros.) * <i>White Queen</i> (Engle.)	<i>Nette O'Melveny</i> (Back, Mrs.)—de Graaff <i>Silver Star</i> (Back., Mrs.)—de Graaff <i>Hera</i> (de Graaff) <i>Gertie Millar</i> (de Graaff) <i>Lord Kitchener</i> (Back., Mrs.)
5	* <i>J. T. Bennett-Poe</i> (Engle.) <i>Queen of Spain</i>	<i>Thalia</i> (v/Wav.) <i>Moonshine</i> (de Graaff)
6		<i>February Gold</i> (de Graaff)
7	<i>Buttercup</i> (Engle.) <i>od. rugulosus</i>	<i>od. rugulosus</i> <i>Golden Sceptre</i> (de Graaff)
8	<i>Aspasia</i> (v. d. Sch., R.) <i>Elvira</i> (v. d. Sch., R.)	<i>Laurens Koster</i> (Vis.) <i>Klondyke</i> (v/d/Sch., R.)
9	<i>Horace</i> (Engle.) <i>Cassandra</i> (Engle.) <i>Ornatus</i>	<i>Ornatus</i> <i>Horace</i> (Engle.) <i>Actaea</i> (Lubbe)
10	<i>Argent</i> (Engle.) * <i>Plenipo</i> (Engle.) <i>Primrose Phoenix</i>	<i>Twink</i> (de Graaff) <i>Cheerfulness</i> (v/d/Sch., R. A.) <i>The Pearl</i> (Zeestraten, G.)

* Varieties no longer available

good daffodils, by the gardening public. In order to do this I should have to have a poll of present-day public opinion in regards to daffodils—something which is not available. I believe, however, that a careful survey of what is offered to the public in the catalogs of our American

seedsmen can be accepted as an indication of what the public is buying. And since we can assume that in making their choice of varieties from these catalogs, the public is guided by its preference of certain types and varieties to others, the relative quantities sold must be a clear indication of that taste.

As it happens, some thirty years ago a similar selection of the most popular varieties was made in England and it is interesting to compare this list with the one that I made up. The 1913 list was arrived at by popular vote at a large daffodil show and the varieties are listed in the order of their popularity. The 1942 list is arrived at as described above and the varieties are listed according to the demand existing for them.

I fully realize that in both lists the factor of price and availability of the bulbs may have outweighed purely aesthetic considerations. Yet it must also be remembered that a variety becomes freely available and low-priced only if it grows well and strongly and propagates quickly. These factors are of equal importance to the commercial grower and the amateur gardener alike, since they indicate a certain resistance to diseases and an ability to withstand climatic and soil handicaps.

Has the fact that the introduction of new daffodil varieties to the American public was largely in the hands of Dutch growers influenced the selections available today in this country? In this connection it must be remembered that in the recent Daffodil Yearbooks Dutch varieties have generally been condemned as being too "rough" and "coarse". I should like to counter this with the suggestion that there is no such thing as "Dutch" varieties. The facts are that the original stocks of hybrid daffodils came from England, notably from Leeds, Backhouse and Barr. The first great step forward in hybrid daffodils was made by the varieties *Madame de Graaff* and *Glory of Leiden*, both raised in Holland from varieties imported from England. Tracing the ancestry of any modern white trumpet daffodils we invariably find *Madame de Graaff* as one of the ancestors. One could cite innumerable such instances where the parentage will reveal what I might call Anglo-Dutch origin. It seems entirely wrong then to speak of "Dutch" varieties versus "English" ones. We should speak of Dutch versus English selections.

It is true that the varieties in the 1942 list were largely selected by Hollanders or originated by them. But these commercial growers did select those varieties that would perform well in almost any garden and that would please the largest number of buyers. Many considerations enter into the final selection of a variety for commercial production. Catering to the "ivory tower" taste of a few experts was not one of them.

This argument, however, is of little importance to the average gardener. He is interested in good daffodil varieties and when he chooses them for his garden or for cutting he is not interested in the fact whether these daffodils were raised in Holland or in England, nor whether they conform with the present British standards.

Looking over the 1942 list from the point of view of the standards set for "show" daffodils we find that very few of the varieties selected are of the geometrically perfect symmetry that is now so highly praised

by some experts. As a matter of fact the great popularity of such varieties as *Diana Kasner*, *Mrs. E. H. Krelage*, *King Alfred*, *Twink* and many others is directly attributable to their informality.

In my opinion, then, the parents of our future garden daffodils should be found among these more informal types and greater stress should be placed by the breeders on adaptability to average garden conditions. What we need first is more strong, prolific and disease resistant daffodils. And, secondly, we need more flowers that are adaptable to garden as well as home decoration. When we once have plenty of such daffodils, we can then begin to worry about refinement of form.

[CALICORE-BRUNSVIGIA—Continued from page 102.]

definitely to *Callicore*. The California common form, widely distributed, is obviously an inbred strain resulting from many years of pure line breeding—few variations appear, although the plants are often self sown in many localities. Other similar forms are also available. All produce very few seed, but as indicated, if any of these strains are crossed they are very productive, and, as one may expect, quite variable in types of flowers produced. Some excellent new colors and forms can always be anticipated, and in numerous cases *Blanda* and *Brunsvigia* types are apparently present. Unquestionably certain *Callicore* genes are dominant, but the writer suspects that few *Callicore*, even those from the wild, are apparently entirely homozygous—some *Brunsvigia* genes being present which turn up as recessives in the progeny.

We must realize that a genus is to some extent an arbitrary grouping for convenience, but there is hardly sufficient reason for a generic division between *Brunsvigia* and *Callicore* especially when fertile hybrids are so readily produced; even Dean Herbert (1825) argued in this fashion, and reinforced his statements with experimental evidence. Why he did not follow his arguments to the logical conclusion we do not know. If the reasons advanced in this present article are adequate then it might be advisable to unite *Brunsvigia* and *Callicore*. The original brunsvigias could constitute one Subgenus and the callicores another. The following new grouping is proposed:

Genus BRUNSVIGIA Heist.

Subgenus No. 1: *Eubrunsvigia* (to accommodate all spp. except the ones newly added).

Subgenus No. 2: *Callicore* Link (To accommodate the following proposed spp.)

1. *B. rosea* (Lamarck) Hannibal, comb. nov.; Syn. *Amaryllis rosea* Lamarck, Dict. Encyc. dr. Bot. Vol. I, P. 122, (1789); *Amaryllis belladonna* Herbert non Linn, Bot. mag. 19, t. 733. (1804); *Callicore rosea* Link, Handb. erkennen Nutzb. etc. p. 193 (1829).

2. *B. blanda* (Gawler) Hannibal, comb. nov.; Syn. *Amaryllis blanda* Gawl: Bot. Mag., t. 1450 (1812); *A. belladonna* var. *blanda* Baker.

NOTES ON RESISTANCE OF DAFFODILS TO VIRUS DISEASES

EARL HORNBACK, *Oregon*

In growing a large number of varieties of daffodils over a period of years, we were struck by the fact that apparently some groups of hybrids seemed to be more susceptible to virus infections than others. It seemed likely therefore that various degrees of resistance to virus infections exist in different groups of hybrid daffodils and that this factor of resistance can be an inherited characteristic.

In modern plantings we still find old forms of *N. Poeticus* and *N. Tazetta*, to all practical purposes identical with the species. These invariably are found to be entirely free from virus diseases, even though they may have been grown over a long period of years in close proximity to other daffodils with a known virus history.

However, old forms of trumpet daffodils, such as *N. minor*, *N. lobularis*, *N. spurius* and *N. obvallaris*, unless carefully selected and grown in an isolated plot, soon become seriously infected and die out. *N. triandrus* and *N. triandrus*, var. *calathinus* have even less resistance to virus diseases and must continuously be renewed from seed. *N. jonquilla simplex* is also susceptible to virus diseases, although not as badly as the above mentioned species. Its hybrids show some degree of resistance to virus diseases.

Among the newer hybrids we find all those derived from *N. Tazetta* highly resistant or possibly even immune to virus diseases. *N. triandrus* hybrids are inclined to weakness, especially when the other parent (such as one of the Leedsii varieties) carries the blood of the old trumpet species or varieties. The percentage of *N. poeticus* blood in the Leedsii used is apparently not high enough to give a good degree of resistance. On the other hand, crosses between the old trumpet daffodils and *N. Tazetta* (such as *St. Patrick*) seem to be immune so that apparently the disease resistance of the Tazetta blood is a very strong factor.

The introduction of *N. hispanicus* var. *maximus* blood to trumpet varieties and later to other types through *King Alfred*, gave a marked improvement in resistance to virus diseases as compared with varieties derived more directly from the old trumpet types.

One hard thing to explain is the tendency of nearly all double varieties to become infected with virus diseases, regardless of their ancestry. For example, the double forms of *N. jonquilla*, *N. cernuus* and *N. poeticus* are definitely more susceptible than the single forms. *Cheerfulness*, the double sport of Tazetta hybrid *Elvira*, seems to be entirely immune.

In the Leedsii, Barrii and Incomparabilis divisions all degrees of resistance are observed, which is easy to understand in view of their very mixed ancestry. Generally speaking, we can notice that those varieties that are most resistant either carry a lot of Poeticus blood or have been improved by the introduction of the Maximus strain. One group of red-cups, which we can trace back to *N. poeticus poetarum* and which culminates in such varieties as *Peking* and *Scarlet Leader*, seems

to be very strongly resistant. At any rate, we have never observed traces of virus diseases in these varieties. On the other hand, varieties which trace their ancestry to *N. poeticus ornatus* do not have this same degree of resistance.

Under the climatic conditions prevailing at our nurseries in Oregon, we should classify the hybrid daffodils on the basis of resistance to virus diseases as follows—(in the order of greatest resistance to greatest susceptibility) :

1. *N. Tazetta* and hybrids
2. *N. poeticus* and hybrids
3. *N. cyclamineus* and hybrids
4. *N. hispanicus*, var. *maximus* and hybrids
5. *N. jonquilla* hybrids
6. Old trumpet types *N. minor*, *lobularis*, *spurius*, etc., and their hybrids.
7. *N. triandrus* species and hybrids
8. Doubles (except double *N. Tazetta* hybrids and Poetaz and Poeticus varieties)

Since modern breeding is being done with varieties carrying either large amounts of *N. poeticus* or *N. hispanicus*, var. *maximus* blood, or both, it would seem that we are already well on the road to further improvement in this respect. It would seem, however, that more use could be made of *N. Tazetta* blood, in an attempt to raise the resistance of our modern daffodil hybrids to virus infections.

In seeking an answer to the great susceptibility of the double daffodils to virus diseases, we find a possible clue in the fact that all daffodils are most susceptible during a short period just before flowering. Attempts to spread the disease artificially by mechanical means were only successful in that period. This period coincides with the stage of the bulb development when the least amount of food is stored and it might be argued that the bulb is at its very weakest stage. Since the formation of the double flower with its multitude of petals would take more food from the bulbs, it might also be argued that the bulbs of double daffodils are weaker than single forms (of the same variety) would be at the same stage of development and hence more susceptible to virus infections.

There seems to be no reason, however, to assume that the varieties in group 6 should be weaker before flowering time than those of group 5 or group 4, while in practical tests a difference in susceptibility can be noticed.

The lack of disease resistance in the *N. triandrus* group might be ascribed to the fact that these varieties are not well adapted to garden culture and that annual lifting and replanting does not seem to agree with them. The same thing might be said, however, for the *N. poeticus* group and we find a remarkable degree of resistance in this group, no matter how the bulbs are handled.

The influence of climatic conditions on the resistance to virus diseases should be noted. Thus we find that some varieties ordinarily resistant in colder climates, will be very subject to the disease when planted in a warm climate. Heat seems to accelerate and intensify the symptoms and infected plants have a shorter span of life in a warm climate than similarly infected plants have in a cooler climate.

Since the *N. Tazetta* species originated in countries with a warm climate (that is, countries with optimum conditions for the spread of virus diseases), it may well be that only plants with an extremely large degree of resistance could survive and that this characteristic became an important factor.

Dividing the daffodils, however, between those originating in warm climates and those originating in cool climates does not offer us any clue to disease resistance factors, since *N. Tazetta* from warm climates are resistant while *N. poeticus*, which come from cool regions, have an almost equally strong resistance.

We must note, however, that the *Tazetta* species and varieties differ from all others in that they show a marked tendency to flower before the foliage has grown to any length. Is it possible then that the bulbs are not in as weakened a condition as the bulbs of other species would be in the period just preceding flowering? The *Poeticus* varieties differ also from other daffodils in that they are never dormant and therefore may be supposed to have a greater store of food than other types of bulbs.

Is it then a food deficiency that would make a daffodil susceptible to virus diseases and can greater immunity be given to our hybrid daffodils by feeding them more strongly in the period of greatest susceptibility? Or would a greater supply of light during this period induce them to store more starches and give them greater resistance?

An answer to these questions would be of the very greatest value to all lovers of the daffodil.

MOSAIC VIRUS IN THE AMARYLLIDS

L. S. HANNIBAL, *California*

Mosaic disease has long been known in *Narcissus*; some clones like "Minister Talma", "Bernadino", and *Triandrus* hybrids are distinctly subjected to it, especially in Southern California. The presence of this virus is shown by a striping or mottling of small light green areas scattered over the surface of the leaf. Aphis have been considered the vector for its spread in Europe, but such is not the case here; although some of the *Tarsonemus* mites may possibly have a hand in it. Bulbs seriously affected by mosaic are weakened and often fail to bloom. Control is only possible by rogueing all infected plants.

Cecil Houdyshel first called my attention to the existence of this disease in *Crinum* and Hybrid *Amaryllis*, and recently Dr. Traub commented on its presence in the *Hymenocallis*. Being well aware that the infection was in a few of my *Amaryllids*, I had been keeping it under observation, without attempting to rogue out the diseased plants since

no serious effects have ever been noted. In a recent examination of about 140 species representing 30 or more genera only the following specimens were found subject to the infection in varying degrees, those marked "xx" being the most seriously affected: *Hymenocallis occidentalis* x; *H. pauciflora* (4 spp. Florida swamp type) x; *H. tenuiflora* x; *Amaryllis rutila fulgida* xx; *A. crocata* ?; *A. Johnsonii*; *A. solandri-flora* var. *conspicua* xx; *A. belladonna* (Equestrian Lily) x; *A. reginae* —x. *fulgida* hyb. xx; *A. Amaryllis aulica* maj.; *Crinum imbriaticum* x; *C. Crinum gigantea* spp. xx; *Crinnodonna Howardii* ?; *Callicore Rosea* form ?; *Cyrtanthus* spp. ?; *Urceolina peruviana* x; *Phaedranassa Carmoli*; *Eucharis Grandiflora*.

Fortunately not many spp. apparently respond to mosaic. It is interesting to note that *Crinum*, *Amaryllis*, and *Hymenocallis* (excluding *Ismene*) seem the most likely to be subject to the infection, but no definite reason can be formulated as to why certain species contract the virus while others are resistant—the most notable being that *Amaryllis rutila* (the type) is resistant while the variety *fulgida* and hybrids are not.

Seeds are not supposed to carry the disease, at least *Narcissus* does not, but whether the green fleshy seed like that of *Crinum* will has not been determined.

BURBANK'S WORK WITH AMARYLLIDS *

DR. W. L. HOWARD, *University of California*
at Davis, California

At the outset I should explain that I am not an Amaryllid specialist or even an amateur florist, but a general horticulturist, whose major interests have been with fruits rather than with ornamentals.

Ten years ago, as a horticultural problem, I began a study of the work of the late Luther Burbank of Santa Rosa, California. No one seemed to know the facts of his professional life, so I undertook to dig them up and set them down on paper. The job is now finished and the results will be published as a Experiment Station bulletin.

Burbank kept no continuous record of his productions. He merely bred new varieties of fruits, flowers, etc., sold them "lock, stock, and barrel," as he often said, and then set about producing something else. Sometimes he announced his new things in his catalogs and price lists, and sometimes they were first advertised by dealers who purchased them as unnamed hybrids. My task has been to study all of his publications that I could find, as well as the announcements of his chief customers, and also to review the leading horticultural literature of the time, for references to anything he might have produced. The magnitude of the

* In this article the amaryllid nomenclature adopted by the American Amaryllis Society and by Standardized Plant Names, 1941, is used. The generic name **Amaryllis** Linn. (not Herbert) is used in place of the synonym **Hippeastrum** Herbert. Accordingly **Amaryllis vittata**, for instance, is used in place of the synonym **Hippeastrum vittatum** Herbert. The generic name **Callicore** Link is used in place of the synonym **Amaryllis** Herbert (not Linn.). Accordingly **Callicore rosea** Link is used in place of the synonym **Amaryllis belladonna** Herbert (not Linn.).

task is indicated by the fact that his working life extended over a period of fifty years, and his total output amounted to between eight hundred and a thousand varieties.

By combing the entire United States I have found one hundred and twenty-seven of his catalogs and price lists which range in size all the way from handbills to an 80-page catalog, in which he offered something for sale. Only one of these publications was devoted to *Amaryllis*, an 8 by 10-inch circular, 12 pages and cover, entitled "A brief descriptive list of the new Burbank *Amaryllis*," which was issued in August, 1909. He called this his "First and last *Amaryllis* bulletin."

Burbank gave active attention to the hybridization of *Amaryllis* Linn. (syn. *Hippeastrum* Herb.) *Crinum*, and *Sprekelia*—all of which he included under the heading of "*Amaryllis*"—for a period of twenty to twenty-five years and kept some of his hybrids under observation much longer than this. In addition he also introduced hybrid *Hemerocallis*.

Amaryllis were the first experimented with—*A. Johnsoni*, *A. vittata* and *A. Reginae*. The *Johnsoni* is itself a hybrid, having been produced by an amateur breeder in England in 1799, so that a cross between it and *A. vittata* (which was one of Burbank's early successes), represented a union between a hybrid and one of its parents. In the next generation *A. aurica* was introduced and then *A. Reginae*, the other parent of *Johnsoni*. Beginning with the fifth generation, he tells us, "several other species of *Amaryllis* were introduced into the combination." There were then crosses and re-crosses between the various hybrids. After about twelve years, he says he had "a colony of mixed hybrids that showed wide departures from any of the ancestral forms." This is the history of his new race of hybrids known as the "Giant *Amaryllis*."

When he felt that he had reached the practical limits of variation to be attained by hybridizing the different species of *Amaryllis*; he extended the experiments by attempting to cross "the new *Amaryllis* hybrids with other allied genera, notably with *Sprekelia* and *Crinum*."

He claims that the *Amaryllis-Sprekelia* cross was at least a partial success. He says: "I have worked on the *Sprekelia* more or less for twenty years, raising probably a hundred thousand seedlings. [doubtless an exaggeration.] But I succeeded only once in hybridizing the plant, with the production of fertile offspring. The hybrid *Amaryllis*, that made union with the Jacobean Lily was my *vittata* type, [his 'Giant *Amaryllis*'], having pale red flowers striped with white. Only a single hybrid of this union bloomed, but from this a number of seedlings were grown. The hybrid offspring of these plants of different genera had long, narrow, strap-shaped leaves much like those of *Sprekelia* (the pollen parent), but the blossoms were very much larger than those of that plant, and they had very curiously twisted petals, unlike those of either parent." [See Figure 78]

He also claims to have successfully hybridized *Callicore* with the genus *Crinum*. "Interesting hybrids were produced by crossing the *Crinums*, not with the members of the [*Amaryllis*] colony (this proving

impossible), but with the form of [*Callicore*]. The hybrids thus produced were a very curious lot. They seemed undecided whether to take on the flat, strap-shaped leaves of the [*Callicore*] or the tunicate leaves of the other parent. The compromise led to the production of a leaf with a long, curious neck."¹ The *Crinum* he used might have been either *americanum*, *amabile* (*augustum*), *asiaticum*, *Moorei* or *bulbispermum* for he used them all.

Dr. George H. Shull, who spent four or five years in Santa Rosa checking Burbank's experiments for the Carnegie Institution of Washington, supports this belief, at least passively. He has kindly supplied me with a paragraph from the manuscript of his report with the comment that he could "only vouch for the fact that this statement had Mr. Burbank's approval." The statement follows?

"Another noteworthy hybrid which Mr. Burbank produced was between [*Callicore rosea*] and *Crinum americanum*, the [*Callicore*] being the seed-parent. While these [*Callicore-Crinum*] hybrids are of little economic value, they are of much interest scientifically. The leaves of the [*Callicore*] are flat and strap-shaped, and those of the *Crinum* are curved and overlapping or rolled over in such a manner as to form a distinct neck to the bulb. In the hybrids the leaves seem to be distinctly intermediate between these two types, being more or less curved at the base and becoming strap-shaped above, sometimes exhibiting a distinct offset between these two portions of the leaf. The flowers are intermediate between the two parents being smaller than the [*Callicore rosea*] and more tubular, but varying through light pink to deep rosy crimson like the [Cape] Belladonna lily. These curious and graceful hybrids multiplied quite rapidly and are easily grown, but have never borne any seed. Efforts to cross them with the two parents have also been without result. None of these hybrids have been distributed, and only a few remain in existence at the present time."

The other achievement with *Amaryllis* was the development of the giant-flowered race of hybrids.

Apparently only eight or ten named varieties of *Amaryllis* were introduced, but a large number of hybrids were announced—136 at one time—and sold without names. Likewise, *Crinum* hybrids were sold without names and without being advertised, according to a statement by Burbank. So far as can be determined all have now disappeared from the trade or have been further improved and their original names lost.

HYBRID AMARYLLIS

Amaryllis vittata hybrida.—Announced in 1905. This was not a single variety but a collection of hybrids from which individual types were selected and given variety names.

Boy Rolf.—About 1905. No information—merely a brief mention in a clipping from an unknown periodical. Possibly one of the *vittata* hybrids.

¹ This is a hybrid that Herbert (1837) mentions in a footnote, and that was later also made by Ragionieri in Italy, (*Crinodonna Corsii*), and by Fred Howard in California (*Crinodonna Howardii*).—Ed.

Burbank's Dwarf Everblooming Fragrans.—Announced by John Lewis Childs, of Floral Park, N. Y., in his catalog for 1909. No information as to its origin, although Burbank once spoke of having received a dwarf *Amaryllis* from Southern Chile.



Fig. 78. *Burbank's Sprekelia*—Martinique. Photo from Burbank catalog by W. L. Howard, Davis, Calif.

Burbank's Giant Hybrids.—1906. This was a race of large-flowered *Amaryllis* that Burbank claimed required ten generations of breeding to produce. The first step appears to have been a cross between *Amaryllis Johnsoni* and *A. vittata*. Then, *A. aulica* and *A. reginae* were brought

into the combination, followed in the fifth generation, with several other species." A few of these hybrids were given variety names and sold, but a far greater number were sold unnamed. One of the types was apparently sold to John Lewis Childs, of Floral Park, N. Y., about 1909.

Coronado.—1913. (Provisional name). The inference is that this variety might have been sold and given some other name. One of the giant hybrids with a complicated ancestry. Said to be an early bloomer and a "prodigious" multiplier. "The flowers, surrounded by a foliage of light green, are of a pure intense scarlet with varied shades of oriental crimson, set three or four to the stalk." Flowers eight inches across—petals three inches. If the variety survived very long, it must have been under some other name.

Martinique.—1909. Described as a cross between *Sprekelia formosissima*, the Jacobean lily, and *Amaryllis vittata*. This was credited at the time with being a unique hybrid among bulbous plants. (See Fig. 78.) "The flowers are a fiery crimson—like those of the Jacobean lily but very much larger. The blooms are nine inches in diameter and are even more remarkable for their long curious, twisted petals, which give the flower a strange appearance and which is not found anywhere among the *Amaryllidaceae*. The leaves are pale green, upright, strap-shape, one inch wide and eighteen to twenty inches long." Following his usual custom of getting rid of new things, in toto, Burbank offered his entire stock of 58 large bulbs and 57 small ones, of this new hybrid, without reserve, for \$350. He added, that seed capsules were produced abundantly but with rarely a viable seed.

Mrs. Burbank.—1901 (?). No information beyond a brief announcement in one of the County newspapers. "In size the variety will average about eight inches across. They increase slowly." Perhaps a hybrid of the same origin as Martinique.

Pomona.—1913. (Provisional name). One of the Giant Hybrids. Described as a very regular flower with a clear, fiery bloom, with broad petals, much overlapping and recurved. "An exceptionally free bloomer, having four to seven flowers to each stalk. The flowers measure nearly two feet around and have a sharp, narrow, white stripe on four petals." No information as to whether it was re-named.

Portola.—1913. (Provisional name). Another one of the Giant Hybrids. That may have been given another name, if sold to a dealer. No record of it has survived. Described as having an immense flat flower measuring nine inches across, pure white, ground-lined and flaked with carmine. "The bulbs are prodigious bearers, having several stalks to a bulb and four flowers to a stalk."

Profusion.—1903. One of the early hybrids, presumably between *Amaryllis vittata* and *A. Johnsoni*. Years later Burbank referred to *Profusion* as having been the most abundant bloomer of its time. In 1909 John Lewis Childs, of Floral Park, N. Y., offered a variety under the name of "Vittata Profusion Amaryllis", with the claim that it was "a superior type of the giant race of *Amaryllis* x *vittata* hybrids." The meaning of this is not quite clear, unless it was intended to inform the reader that the *Profusion*, too, was one of the Giant Hybrids, then being

flamboyantly announced. And it was, but the latter had had the benefit of two or three additional years of improvement.

Seedling Amaryllis.—1909. One hundred and thirty-six numbered hybrids were announced at the same time. All were the result of a series of complicated crosses involving four or five species. These, collectively, were known as the Giant Amaryllis.

There was a total of 3,117 bulbs in the lot, priced at an average of about \$1.55 each. The number of bulbs to each number ranged from one to over two hundred. In all cases the purchaser was expected to purchase the entire stock of a particular hybrid with full control. The copy of the announcement from which these notes were compiled evidently had been used the year before—or earlier—as thirty-three of the numbers are marked in red ink, “sold.” There is also a notation on the front cover page, in red ink, in Burbank’s handwriting, announcing “50 per cent discount to the trade,” and a conspicuous notice is pasted on the inside to the effect that he could now offer the seedlings described at a greatly reduced price from those originally quoted. Apparently they did not sell too well. Perhaps the prices were thought to be too high or the buyers wanted more than one number but did not care to invest more than a moderate sum at one time. At any rate, almost without exception, those that were sold were in the low-price brackets, indicating that they went to small dealers and amateurs. Then followed a brief description of each of the 136 numbers.

HYBRID CRINUMS

In his autobiography Burbank says: “I have grown about twenty species (of *Crinum*), some of them of tropical origin. Numerous crosses were made among these species until I had a cross-bred strain of Crinums of ancestry as complex as that of my [*Amaryllis*]. The seed parent of a large proportion of the hybrids was the species known as *Crinum americanum*, but a few were grown from the seed of *C. amabile* (*augustum*) and *C. asiaticum*.” He claimed that in the various crosses, the traits of the species of temperate zones appeared to be dominant. Several of the hybrids were sold as numbered seedlings, but there is no information as to whether any have survived.

Burbank Hybrids.—1901, 1906, 1914, 1927. “- - - - white and pink shades, immense bulbs - - - - great snow-white blossoms often shaded pink and rosy-crimson; generally slightly or strongly fragrant. A cross of the best greenhouse species with a hardy one - - - -. The flowers are various shades of pink and white, about six or seven inches across borne on stout stalks three to four feet in height resembling enormous Easter lilies. - - - - the *Crinum* bulb grows to gigantic size, often weighing as much as four to eight pounds - - - -.”

HYBRID HEMEROCALLIS

It is not clear what work was done with the daylilies (*Hemerocallis*), that is, whether the four varieties announced were known hybrids or merely selected seedlings.

Burbank.—1917. Advertised as a hybrid, but there is no confirming evidence. A. B. Stout (Daylilies, p. 43), says the plants were “as much as thirty-four inches tall and the flowers yellow with rather narrow segments. Very like *H. Thunbergii*.” Distributed by Carl Purdy, of Ukiah, California.

Calypso.—1918. No information as to its origin. “The flowers of *Calypso* resemble big pure, lemon-yellow lilies - - - -. The flowers are produced nearly all the season; the petals are revolute like the true lilies; height three feet.” Distributed by Carl Purdy, of Ukiah, California.

Cygnet.—1924 (?). George L. Slate (Lilies for American Gardens, p. 46), says of the *Cygnet*, “Mentioned by Mr. Morrison in 1924 (House Beautiful 55:69) and origin credited to Burbank.” No further information.

Surprise.—1917. Spoken of as a “cross-bred seedling.” “Flowers, a very light straw-yellow—almost white—very large, full and open. Blooms almost constantly through the season; height, four feet.”

DIVERSITY OF FORM IN DAYLILIES

J. MARION SHULL, *Chevy Chase, Maryland*

Half scientist, half artist, the author admits his inability to classify what follows so will leave to the trained librarian the problem of determining whether it should be filed under the heading of Art or Science.

In presenting this study of daylily form there is no intention to assume the role of advocate. All forms may be good, and no one is best, whether good or not so good is entirely beside the question at the moment. The presentation may be far from complete; certainly there are infinite graduations from one to another among those here shown. Neither is there any intent to trace these forms back to their specific origin. Instead I offer them merely as observed facts, mostly culled from seedlings grown in my own garden during some fifteen years of breeding work with *Hemerocallis*. Included are several named varieties from other sources. The designations in the case of unnamed seedlings have no other significance than to serve as suitable labels for reference. They grew out of the breeding records and have been retained here purely as a matter of convenience. With this apologia out of the way I plunge into such discussion as seems warranted.

With the exception of *Duchess of Windsor*, *Mayor Starzynski*, and *Rajah*, whose ancestral backgrounds I can only surmise, the clones illustrated here all have *Hemerocallis fulva* as a grandfather or great-grandfather, with *H. serotina (thunbergii)* in corresponding relationship on the maternal side. Collaterally introduced into the life stream of some of them, sometimes on maternal side, sometimes on the paternal, are such other partially known entities as Perry's *Iris Perry*, probably closely related to *H. aurantiaca*; *Florham*, of quite dubious ancestral status, and Franklin Mead's *Hyperion*, presumably related to *H. citrina*.

Inasmuch as none of this makes evident sense or seems to explain anything in relation to the variability of form under consideration the reader is invited to accept it merely as a passing observation devoid of intentional value as proof or support on any particular thesis.



Upper row, Daylily flower form: left, A-1 (Shull) X Rajah; petaline segments erect; sepaline segments recurved; center, petaline segments erect with lips recurved, sepaline segments recurved; **right**, Gorgio X Rajah, sepaline segments erect, petaline segments recurved.
Lower row, Daylily flower form: left, D-5 (Shull), Ophir X "Thulva", spidery aspect with long narrow segments; right, B-1 (Shull) X Rajah, wide petaline segments, sprawling, flamboyant.

The grouping into figures has of necessity been something of a compromise between related characteristics and the exigencies incidental to the engraving and printing arts. Partly it is determined by natural similarities of the subject matter, partly by the demands of space utilization.

In Plate 230, upper row, for instance, we have types that are not of very frequent occurrence. This is fortunate perhaps since for the most part they have little garden value. They are similar in that all three provide different aspects of the two sets of segments, the sepals and the petals. At the left the sepals are recurved while the petals are ascendant to nearly erect and not recurved.

In the center the petals are both ascendant and recurved giving a two-storied effect suggestive of hose-in-hose as occurring in some other garden flowers.

At the right the characters are reversed and it is the sepaline segments that ascend while the petals are markedly recurved. This variety is derived from *Gorgio* by *Rajah* neither of which shows any suggestion of such characteristics.

The lowered garden value of this group is largely due to the fact that in nearly all daylilies, except some of the yellows, the inner faces of the segments are more richly colored than the outer and specimens such as are shown at left and center do not provide a proper display of these better colors.

In Plate 230, lower row, we have a striking study in contrasts. Both are much above average size, the left with long and narrow segments and a general spidery appearance not at all unpleasing in its clean pale lemon yellow. This is derived from *Ophir* by "*Thulva*" and related through the latter to *Thunbergii* and *Fulva*.

On the right is a huge blowzy thing with red petals and orange to red sepals, whose ancestry includes *Iris Perry* by "*Thulva*", which means that *Fulva* is the great-grandfather. Immediate pollen parent of this is *Rajah* which may account for some of its color but contributed little in the matter of form.

In Plate 231, upper group, there is an apparent kinship of form in left, right and lower. They possess in common great width of segment relative to length and all show a considerable degree of regularity. The seedling at left, and *Duchess of Windsor* at right, are almost perfectly regular. These two open out almost flat. Seedling at left is a grand-child of *Iris Perry* by "*Thulva*"; a great-grand-child of *Thunbergii* by *Fulva*. Derivation of *Duchess of Windsor* is unrecorded.

Below is Dr. Traub's *Mayor Starzynski*, a variant to the extent that the tips of the petals are thrust forward instead of being slightly recurved as in the other two.

Above, and in contrast with these, is the narrower segmented triangular built *Rajah* of Dr. A. B. Stout. *Rosalind* and many others are of this same type.

Rajah, as immediate pollen parent of six of the varieties selected for use in these figures, does not seem to have contributed materially to their inheritance of form.



Upper group, Daylily flower form: left, a seedling of B-1 X Rajah, with wide segments and quite regular; right, Duchess of Windsor, with very broad petaline segments, opening nearly flat; below, Mayor Starzynski, petaline segments broad with tips thrust forward; above, Rajah, segments narrower, triangular form (fairly frequent occurrence).

Lower row, Daylily flower form: left, Musette, oblanceolate petaline segments not recurved, gives distinct star shape; right, A-1 (Shull), full sister of Musette, very irregular, seedling of Hyperion with serotina and Fulva as great-grandparents.

In Plate 231, lower row, are two full sisters from *Hyperion*, parents, grand-parents and great-grand-parents the same. At the left, *Musette* (A-6-Shull), a bright, ripe-banana color; segments hardly at all recurved and presenting a starry form unlike anything else on the place by reason of the oblanceolate segments, widest at about two-thirds their length from the base.

On the right, A-1 (Shull) has all its sepals and two of the petals exaggeratedly recurved while the one remaining petal is usually a long thrust out tongue, making a flower that is extremely irregular. Color is a light lemon yellow throughout.

Not a matter of form but nevertheless a matter of interest is the fact that these sisters not only differ in form but *Musette* is strictly a day bloomer, opening early in the morning and remaining until dark, while A-1 opens in the evening and is spent by late afternoon.

Figure 79 presents an interesting study in curls. At right is F-3 (Shull), a very strongly marked bicolor, petals mahogany red and sepals



Figure 79. Daylily flower form: right, F-3 (Shull), all segments greatly recurved; left, F-3 X *Rajah*, segments spidery-curly-twisty; center, F-3 X *Rajah*, petaline segments broad, curly-twisty.

sienna yellow but the chief immediate interest being form, attention is called to the extreme curling back of all segments. F-3 is itself a great-grandchild of *Thunbergii* and *Fulva*, and it, with *Rajah*, gave rise to the two at center and left of Figure 79. These two sisters, therefore, are great-great-grand-children of *Thunbergii* and *Fulva*—but how very unlike! At the left is a very smooth bright yellow that might be characterized as spidery-curly-twisty, a very graceful and lovely flower in every respect, somewhat on the order of Dr. Traub's *Theodore Mead*.

Its full sister, center, is long-curly-twisty also but not so spidery by reason of its wider and more ruffle-margined petals. These rather long, twisty and curling segments appeared in nearly all members of the family F-3 by *Rajah*.

As was said in the beginning I am not advocating any of these varied forms as superior to any others. So long as proportions are good and color effective any form is or should be acceptable. That we should have personal preferences, likes and dislikes, is only natural and to be

expected, and it is always a mistake to elevate any group of requirements to the status of perfection and then ask that all others be measured in terms of, or in comparison with, this proclaimed standard.

I personally like a number of these forms, but I never stop marveling at their diversity, for which I find no explanation in contemplating the ancestral picture back of them. True, that picture is not entirely clear. There are blurred spots in it. Collateral lines are not always fully recorded, sometimes not recorded at all, like a foundling left anonymously on some friendly doorstep. I do not know what lies back of such things as *Florham*, *Iris Perry*, *Ophir* or *Rajah*, but in themselves I do not find any suggestion of the variations that have come out in these descendants of *Thunbergii* and *Fulva* in the course of several generations. And the color variations are almost equally bewildering.

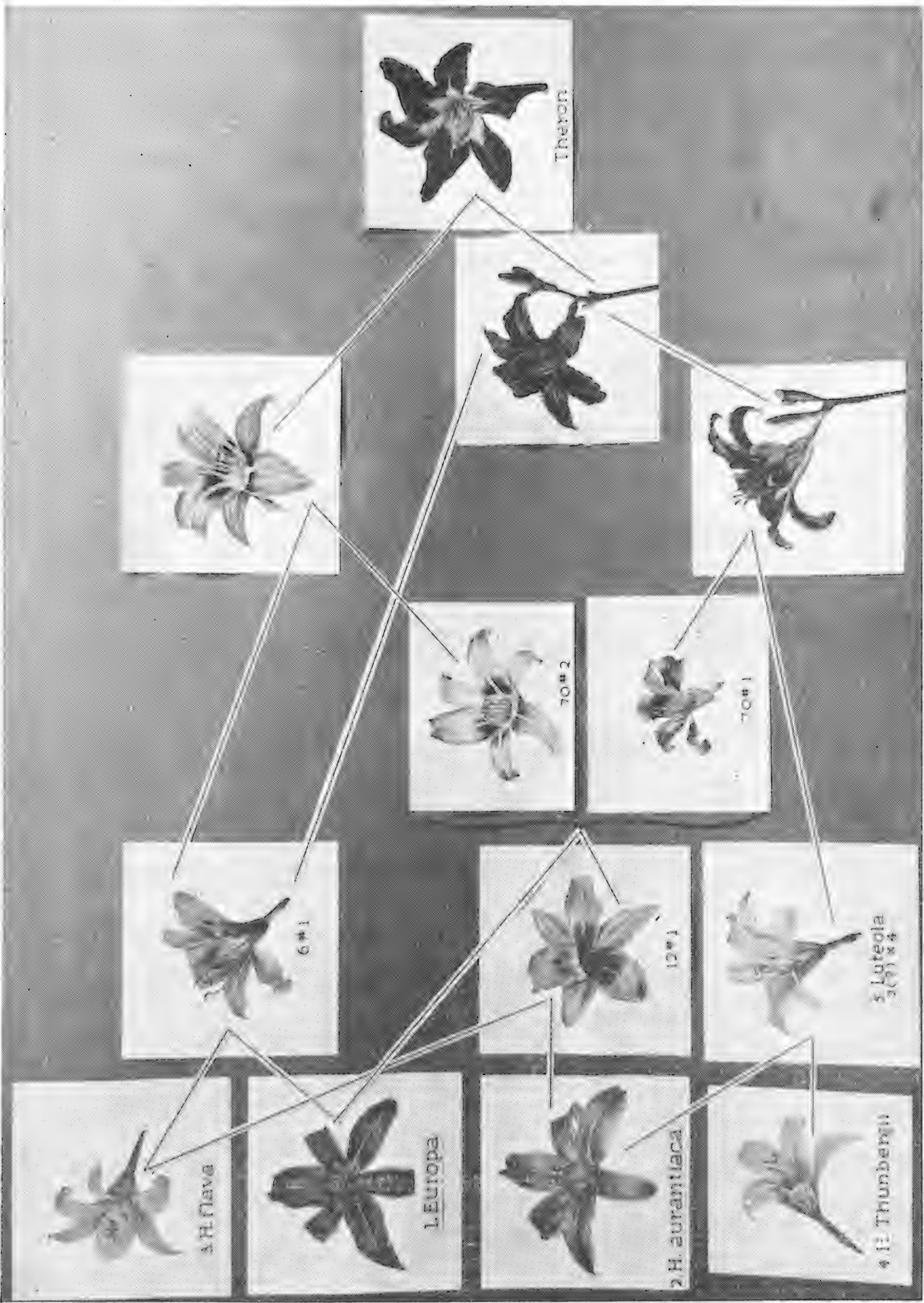
ORIGIN AND GENETICS OF SOME CLASSES OF RED-FLOWERED DAYLILIES

A. B. STOUT,
The New York Botanical Garden

The term "red-flowered" may be applied to the daylilies which have in addition to non-red pigments some shade or degree of red sap pigments, presumably anthocyanin in chemical nature, visible on the inner face of the open flowers. The members of the species *Hemerocallis fulva* (4, 5, 14*) (including the *H. disticha* and the *H. longituba* of certain writers) have flowers of this character in a considerable range of patterns and tones that are mostly orange-red in color. A clone that was named "*H. aurantiaca*" (6) has flowers with dull orange red coloring in a relatively simple pattern that is two-toned distal (near no. 4 of plate 233). The breeding behavior of this clone clearly indicates that it is heterozygous for two important characters, (a) the evergreen habit of growth and (b) the fulvous red coloration of its flowers. This clone can not be considered as a type of a "good species." It is evidently a hybrid and in this article it will be considered as a horticultural clone and designated as the *Aurantiaca* Daylily. A clone with flower coloring very near to that of the *Aurantiaca* Daylily has been considered a type of a variety which was named *H. aurantiaca littorea* Nakai. A somewhat rare clone in cultivation in the Royal Botanical Garden at Edinburgh, Scotland, under the name "*H. fulva angustifolia*" has small flowers in the face of which there is a halo of red coloring. Except for the daylilies mentioned above the "species" of *Hemerocallis*, at least of those known and named at the present time, have flowers that are only yellow or orange in the face of the open flowers.

Distribution of red sap pigments in plants of Hemerocallis. It should be noted that many daylilies, including most of those that display no red in the face of the flowers, do have red pigments somewhere in the plant. Dull dark-red pigmentation in the back side of the sepals and on the tube is characteristic of the flowers of some, but not all, members of *H. Dumortierri*, *H. minor*, *H. Middendorffii*, and *H. multiflora* and

* References to literature citations at end of article.



Dr. A. B. Stout, New York Botanical Garden
Pedigree of Theron Daylily; shading indicates pattern and degree of red-coloring in flowers of each plant involved in the ancestry.
Plate 232

red coloring is noticeable in the bracts and scapes of many plants of these species. The *Lemon Daylily* and some plants of *H. citrina* have purplish-red or almost black coloring in an area at the tip of the sepals. Some plants of *H. citrina*, *H. Thunbergii*, *H. minor*, *H. Middendorffii*, and *H. esculenta* have rose-pink or even bright red coloring in the base of the leaves and often the capsules are strongly colored to a red that is nearly black. Dull brownish red pigmentation appears in the older roots of certain daylilies but this may not be due to anthocyanin. Individual members of most of the species mentioned above appear to have no red coloring anywhere in the plant, and this is the case for the clone known as "*H. aurantiaca Major*" and some of the horticultural clones. Thus a survey of the wild species and the types represented in the older of the cultivated clones of daylilies indicates that many have red pigments somewhere in the plant but only a few have red coloring in the face of their flowers.

Other pigments and their influence on red coloring. It should be mentioned that in addition to the anthocyanin sap pigments in flowers of daylilies there are also yellow and orange pigments that are important in the flower coloring. When homozygous clear orange-flowered daylilies are hybridized with clear yellow-flowered daylilies the flowers of the F_1 hybrids are, in my experience, *always* intermediate in shade of coloring, and there is a wide range in the grades of coloring in the later generations. It is the rule in the fulvous daylilies that red pigments do not develop in the throat of the flowers and in this area the green, yellow, and orange pigments provide the coloring. Outside of the throat in the outer two-thirds of the radius of a flower the yellow or orange pigments of the inner tissue blend with the more epidermal red pigments to produce the coloring effects which one sees. The same quality and intensity of red pigments will appear differently when combined with orange than when combined with yellow. Thus in hybrids obtained by complex hybridizations and selective breeding two rather distinct effects are to be recognized. The various yellow and orange pigments modify the appearance of each class of red pigmentation merely as mixtures of pigments, and there are modifying reactions between genetic factors which produce changes in the quality and the intensity of red pigmentation and in the patterns of distribution.

The early breeding for red-flowered daylilies. Few members of the fulvous daylilies of the Orient were known in Europe and America previous to the collections obtained by The New York Botanical Garden beginning in 1924 (5; 7; 8; 14; 17). In fact not more than a half dozen fulvous daylilies from the Orient were propagated as clones previous to 1924 (4, 5, 14), and it happened that these had flowers relatively dull orange red in coloring. The limited breeding that was done with these clones in Europe was confined to the production of a few members of a first generation. None of these had other than rather dull fulvous coloring, if one is to judge the introductions *Halo*, *Gold Ball*, *Pioneer*, and the *Fulcitrina Hybrids* (14). Also the fulvous daylilies introduced for horticultural culture previous to 1930 and a large number of those introduced since that date have dull orange red coloring.

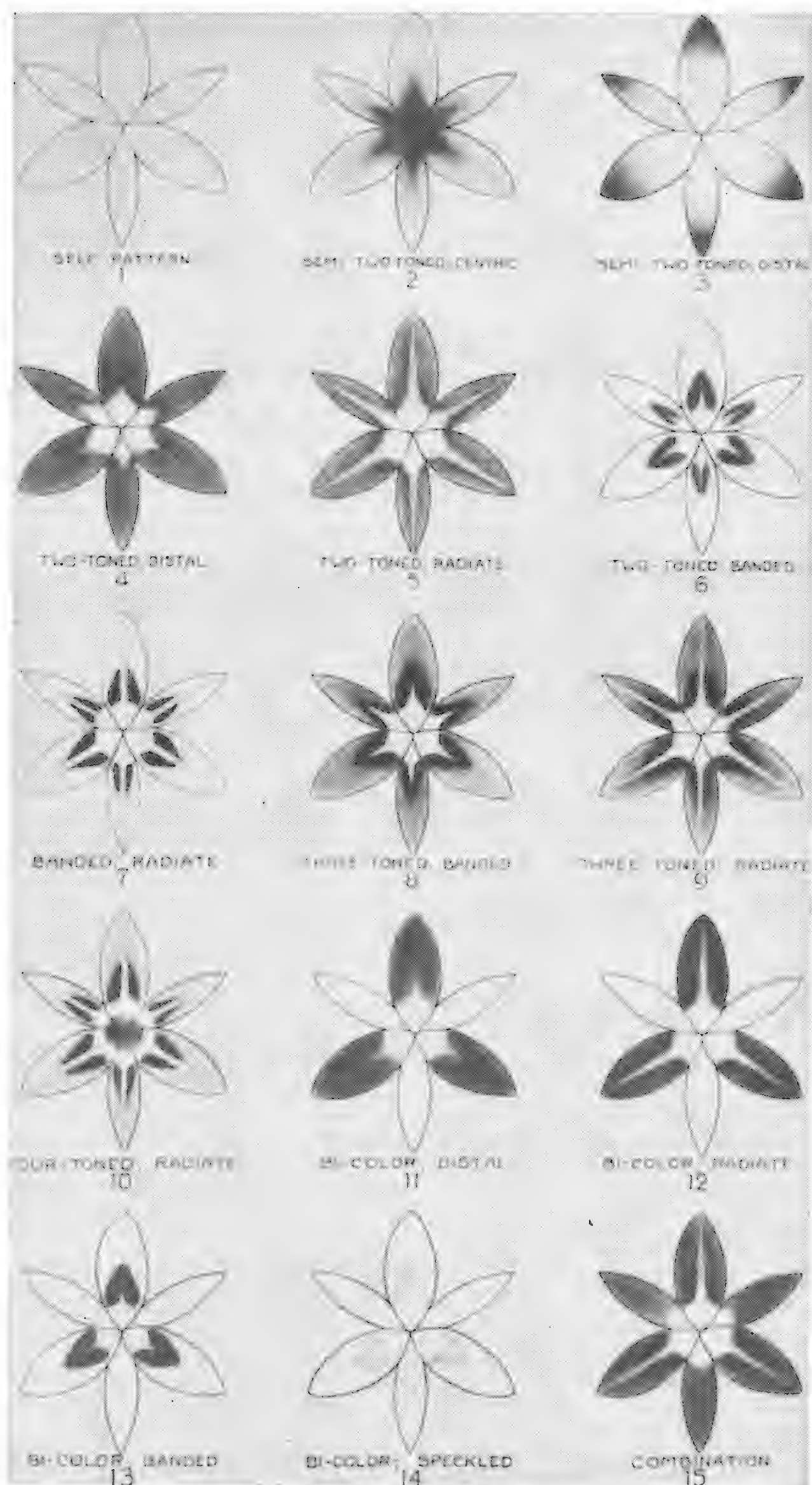


Illustration showing principal color-patterns in flowers of Hemerocallis. This plate drawn at New York Botanical Garden by Miss Eleanor Clarke, through cooperation of Works Progress Administration (O. P. 165-1-97-8. W. P. 5).

Complex hybridizations and selective breeding. The production of new types of red-flowered daylilies was one of the aims in mind when the writer began breeding work with *Hemerocallis*. At that time, except for the double-flowered clones *Kwanso* and *Flore Pleno*, the only fulvous daylilies available at The New York Botanical Garden were (1) ramets of the triploid clone ($3n=33$ chromosomes) which is the Linnaean type of *H. fulva* and which was later named the *Europa* Daylily (4) and (2) ramets of the *Aurantiaca* Daylily. These clones proved to be so completely self-incompatible that no mature and viable seeds have thus far been obtained at the New York Botanical Garden from either one by self-pollination. Hence there has been no opportunity for selective breeding within selfed progenies of either of these two fulvous red daylilies. [See addendum on bottom of page 173.]

Attempts to hybridize these two clones began early in the investigations. Many cross-pollinations were made using each as a seed parent, but no viable seeds were obtained. The *Aurantiaca* Daylily has since been hybridized with certain other members of the species *H. fulva*. What may be called an indirect hybridization of these two clones was accomplished. Each clone was hybridized with certain yellow-flowered and orange-flowered daylilies that were available and then certain of the hybrids thus obtained were interbred and also crossed with the other fulvous clone that was not already in the ancestry. In this way pedigreed progenies which totaled about 500 seedlings were soon obtained which had both the *Europa* Daylily and the *Aurantiaca* Daylily in their ancestry (3).

With these seedlings at hand further lines of breeding were undertaken. (a) There were further hybridizations with members of yellow-flowered and orange-flowered species and with other types of daylilies (including fulvous daylilies) as these were obtained from various sources; (b) there was selective breeding in respect to particular qualities, and especially for those that were new; and (c) there was selective breeding for new combinations of two or more characters.

It should be mentioned here that none of the first two generations of the breeding indicated in Plate 232 was ultimately considered worthy of introduction as a horticultural clone. Some of these were kept as selections for several years but were discarded when they were definitely surpassed by individuals of other progenies and especially of later generations (11).

Complex hybridizations and selective breeding have continued to the present date and the progenies obtained have provided remarkable diversity and extremes of expression in quality and intensity of colorations and in the patterns of color distribution, especially in respect to red pigmentations.

Since pedigree records have been rather fully kept, many aspects of the genetics of new color classes and pattern classes are known. But in daylilies incompatibilities often prevent self-breeding which would result in pure lines and they also limit free cross-breeding among all members of a progeny. When selfed progenies have been obtained they were usually so weak from loss of heterosis that they were worthless.

Hence tests in pure line breeding for the breeding behavior of characters and for the precise genotypic compositions of phenotypes and genotypes have not been made. The selective breeding which the writer has done with daylilies has involved the cross-breeding of individuals.

For adequate and comparative descriptions of the many clones of horticultural daylilies it is desirable, if not necessary, to recognize the main classes of coloring and the types or classes of patterns in the distribution of pigments. A survey of the latter was made by the writer (18) with publication of the plate which is here shown in Plate 233. It may be stated that the supply of the issue of the Journal which contained this article and of the reprints of the article itself was entirely distributed soon after the printing.

The Theron class. One line of the selective breeding mentioned above produced a class of dark red daylilies of which *Theron* is the first of the named clones (12; 14). Plate 232 shows the pedigree of this plant and the extent of the shading in the flowers that are represented somewhat indicates the intensity of the red pigmentation in the flowers of each of the plants involved in the ancestry.

In the several generations of hybrid progenies which included the plants of the pedigree of *Theron* there were segregations which had simpler color patterns than that of *Europa*, and also there were segregations for both reduced coloration and intensified coloring. The *Theron* class is an end product in the selection for intensified dark red coloration.

The immediate parents of *Theron* were (1) a plant of series 145 which had flowers with the outer part light red fulvous and a midzone of a dark red that approached maroon and (2) a plant whose flowers were a dull and somewhat maroon shade of red that was rather uniform for the entire blade. Neither of these two plants set seed to self-pollination. It is noteworthy that *all* of the 16 plants, in the progeny of which *Theron* was a seedling, had flowers that were, except in the throat, dark red in shades near maroon and Mars violet as these are shown in Ridgway's Color Standards (1) and that in the quality and degree of red pigmentation they surpassed every individual of the ancestry and every member of all progenies of daylilies hitherto grown by the writer. There were minor variations among the 16 plants in the precise shade and intensity of the pigmentation especially in the mid-zone of the petals. In what may be called the THERON CLASS the coloring approaches maroon, violet carmine, Mars violet, and their associated shades including black.

Several aspects of the genetics of the new color class which the *Theron* Daylily represents are clear. It is not a reversion to a wild ancestral type but is quite new to the genus *Hemerocallis*. There is a new association of genetic factors which are complementary in producing intensified pigmentation, not only in the mid-section of the flower but also in the distal portion. It seems obvious that there is an increase in the quantity of pigment; it is quite probable that some feature of the chemical composition is new.

The *Theron* Daylily has thus far yielded no seeds to self- and intra-clonal pollinations. The results of selective breeding indicate that intra-bred progenies of the THERON CLASS may give progenies all of which

are of the same color class, with however some minor variations. The *Theron* Daylily has been a parent in twenty-two different hybridizations. With homozygous yellow-flowered and orange-flowered daylilies the F_1 hybrids have flowers that are much paler and duller than are the flowers of *Theron*, but usually there are somewhat maroon and even purplish shades in the coloring that suggest the quality of pigmentation seen in *Theron*. Plants with flower color and pattern similar to *Theron* have segregated in various progenies of complex origin. In some cases there has been only one such plant in a series of considerable number along with segregations for clear orange or yellow coloring. Some of the segregations approach black in coloring and others are in shades approaching purplish black.

Several other seedlings which have flowers of dark red coloring have been named as horticultural clones. Of these the *Vulcan* Daylily has in its ancestry the *Aurantiaca* Daylily, the *Luteola* Daylily and a red-colored selection derived from wild plants of *H. fulva*. Another dark red daylily with orange influence is *Wolof* which has in its ancestry *H. Thunbergii*, the *Aurantiaca* Daylily, and *H. fulva rosea* clone *Rosalind*. The seedling that was named *Nada*, which had flowers of Morocco red and claret-brown coloring, has in its ancestry the *Aurantiaca* Daylily, the *Europa* Daylily, *H. flava* which has yellow flowers, and *H. nana* which has orange flowers. It should be noted that the development of the dark red or THERON CLASS of daylilies, or daylilies of any red color except pink, has *not* depended on the use of *H. fulva* var. *rosea* as stated in HERBERTIA volume 8, page 103.

Thus far the results obtained by the writer indicate that the THERON CLASS of coloring appears in pedigrees that have in their ancestry (a) the *Aurantiaca* clone, (b) members of the species *H. fulva*, and (c) either one or both of the yellow-flowered daylilies known as *H. Thunbergii* and *H. flava*. It has also reappeared in progenies that had *Theron* in their ancestry. It has not appeared in any intra-breeding thus far done with members of the *H. fulva* group including the *rosea* variety, but in such progenies there have been plants with somewhat intensified coloring.

The Mikado pattern and its origin. In this daylily (for colored plate see 9 and 14) there is a mid-zone of the petals with intense red coloring that is close to Morocco red of Ridgway, there is sometimes a faint narrow band in the corresponding area of the sepals, and there is little fulvous coloring elsewhere in the face of a flower.

The banded feature seen in the *Mikado* Daylily segregates in the F_1 progeny obtained when the *Aurantiaca* Daylily is hybridized with the pure yellow-flowered "*H. flava*" (clone in cultivation known as *Lemon* Daylily) or with the orange-flowered *H. Middendorffii*, *H. exaltata* and *H. Dumortierii*. But in these F_1 progenies the degree of the coloring in the mid-zone is usually pale. The seedling that was named *Mikado* is one of series 118 whose pedigree is indicated in Plate 232. The hybridizations of this pedigree brought together modifying factors which broke up the patterns seen in the *Aurantiaca* and the *Europa* Daylilies and the mid-zone feature or element was segregated. Then the selective

breeding assembled or increased in number certain intensifying factors. Thus far, the *Mikado* pattern has not segregated in the intra-bred progenies of plants exclusively *H. fulva*. But plants whose flowers have a rather uniform red pigmentation (two-toned distal, as No. 4 in Plate 233) have been seen both in wild plants of *H. fulva* and in their intra-bred progenies, and some of these, as the *Cinnabar* Daylily, have been propagated and named as clones.

Several hundred seedlings have been obtained which had flowers with the two-toned banded pattern. Among these there is almost endless variation (a) in the width, size, and shape of the colored area, (b) in the shade of color, and (c) in the intensity of the coloring. Also the mid-zone may develop in the sepals (Nos. 6 and 7, Plate 233) in numerous further variations or it may develop only in the petals (No. 13 in Plate 233) to produce a fully bicolored pattern. It is obvious that *many hereditary factors operate* in producing the more secondary features of this pattern.

The bicolored pattern. Many wild fulvous daylilies have flowers in which the petals are more strongly colored than the sepals. But still greater extremes of difference which give distinctly bicolored flowers soon appeared among hybrids. The most noticeable of these have the distal two-thirds of the petals outside of the throat strongly red colored while the sepals have little or no red coloring. Further modifications are seen in whether the pattern of fulvous coloring is rather uniform (no. 11 in Plate 233), or radiate (no. 12), or banded (no. 13) or two-toned (as the petals only in no. 8).

The bicolored pattern with distal distribution of red coloring (no. 11, Plate 233) appeared in F_1 progenies of crosses between (a) certain plants with flowers of clear yellow or orange colors and no fulvous coloring and (b) plants with fulvous coloring (16). In such a case the characters concerned are *yellow non fulvous* \times *fulvous* = *bicolor*. One may consider that in this case the yellow character of one parent is dominant in the sepals while the fulvous character of the other parent is dominant in the petals. In several cases all the seedlings of such a progeny had bicolored flowers. Fully and strongly bicolored flowers have not been obtained by the writer in any intra-breeding among plants of *H. fulva*.

Compared with the pattern of the *Europa* Daylily the bicolored patterns exhibit a reduction in the extent or area of the fulvous pigmentation and a segregation of sepal coloring from petal coloring. Genetically the origin of this class involves the interaction of factors brought together by certain hybridization.

Frequently one notes flowers of fulvous colored daylilies in which the sepals are more strongly colored than are the blades of the petals. Occasionally seedlings have been obtained in whose flowers the sepals are noticeably more strongly colored than the petals with the color of the latter decidedly reduced. In such a pattern the relative coloring of petals and sepals is the reverse of that shown in no. 11 of Plate 233. Horticultural clones with this reversed bicolor pattern will probably be known in the near future.



Flowers of wild fulvous daylilies. Nos. 1 and 2, from near Kuling; 3 and 4, from Purple Mountain near Nanking; 5 and 6, intra-bred seedlings. No. 1 is near the **Europa** Daylily in pattern and coloring; Nos. 2 and 4 are pale fulvous; No. 3 is somewhat darker orange red than is **Europa**; No. 5 is rose pink; No. 6 is crimson red and has the narrow petals characteristic of many of the wild fulvous daylilies.

Rose-pink daylilies. An approach to rose-pink tints in the flowers of daylilies has appeared in the flowers of some of the seedlings obtained when certain fulvous daylilies including the *Europa Daylily* were hybridized with *H. Thunbergii*. I judge that others have had similar results. But thus far no really good rose-pink or pink-flowered daylilies, have, I believe, been obtained in the progenies of such plants.

A race or variety of definitely pink-flowered daylilies has been derived from plants that came to The New York Botanical Garden in 1924 in a shipment of live plants collected in the wild near Kuling, China by Dr. A. N. Steward. When these plants flowered at New York it was first noted that three of them had flower coloring definitely rose-pink in tint. These plants were propagated and used extensively in intra-breeding and in hybridizations. Divisions of the original plants and of some of their seedlings were distributed from the New York Botanical Garden. The botanical name *Hemerocallis fulva rosea* was given (8) to this pink-flowered variety, including the intra-bred progeny and the wild members presumed to exist in China.

The individual plant selected as the type of this variety and illustrated in a colored plate (8) is one of the plants from the wild. Its flowers have a banded three-toned color pattern (no. 8 in Plate 233), but with the band rather weak in the sepals. The pattern is near that of the *Europa Daylily* which is the Linnaean type of the species *H. fulva*. The type plant has been propagated and widely distributed and to this clone the name *Rosalind* has been given (17). For one of the wild plants and for some of the intra-bred seedlings, as *Charmaine*, the mid-zone or band of darker coloring is lacking and the coloring outside of the throat is almost uniform for both petals and sepals giving a two-toned distal pattern (no. 4 in Plate 233). It has already been mentioned that this pattern is frequent in fulvous daylilies of other than pink coloring.

Dr. Steward (2) has described the region where the collection was made which included the pink-flowered plants. But data are not reported regarding the abundance and range of the pink-flowered plants and what admixture of color types exists in the daylily population in the region about Kuling. Later shipments of seeds and living plants of daylilies from Dr. Steward and from the Lushan Arboretum have not included a single plant which had pink-colored flowers, nor has any such plant been obtained by the New York Botanical Garden from any other locality in the Orient.

The writer has used *Rosalind*, *Charmaine*, and numerous pink-flowered seedlings in selective breeding and in hybridizations (17). In the F_1 generation the pink-color character is decidedly recessive to other shades of red pigmentation; it is even greatly modified and often reduced when one parent is a non-fulvous daylily with either orange or yellow flowers. The pink character segregates in later hybrid generations, sometimes in a few of the progeny and sometimes in considerable number depending on the genetic composition of the parents. Among the derived seedlings there is almost endless diversity in tints of pink and in gradations to the tints next to pink as given by Ridgway (1),

and in some cases the coloring appears to the eye as somewhat purple. It seems that the clearest pink colorations are associated with yellow or pale orange pigments or with the absence of plastid pigments in the outer part of the flower.

Most fulvous daylilies have poor foliage in mid-summer when the older foliage becomes more or less dead and unsightly. This condition has been the rule for most plants of the *rosea* variety. Also some plants have suffered severely from winter injury and others from damage by thrips. Many of the most beautiful of the pink-flowered selections, and also of the scarlet red class to be mentioned next, which have been under propagation have been discarded because of one or more of these conditions.

The scarlet-red color class. This color class in daylilies may be described as a somewhat brighter red than is seen in the *Europa* Daylily. The range of coloring more fully approaches spectrum red, scarlet red and scarlet as these are represented in plate 1 of the Ridgway Color Standards.

Several individuals of the wild fulvous daylilies collected by Dr. Steward near Kuling have flowers with coloring of this quality. Plants received from other parts of China also have somewhat brighter red coloring than have the flowers of the *Europa* Daylily. One of the clones of this class obtained from Chengtu, China, was named the *Chengtu* Daylily (15). The flower coloring is orange scarlet of a tone near grenadine red and the mid-zone of the petals is near Nopal red. Intra-breeding with these plants soon gave a race of which *Red Bird* is representative for coloring. Some of these seedlings were first shown in a colored illustration in 1930 (10). Various seedlings of this class, and also of the rose-pink class, that were discarded in the selections were included in the distributions made in 1934 to members of The New York Botanical Garden (13).

Plants of the scarlet-red class have been extensively used in cross-breeding and some of the named clones of complex origin, as *Dominion*, *Baronet*, *Rajah* and *Port*, have some one or more plants of the scarlet-red color class in their ancestry. The *Rajah* Daylily has for one parent *Mikado* and for the other parent the flowers are crimson red in a two-toned distal pattern. In *Rajah*, therefore, the two features of red coloration seen in the three-toned banded pattern are recombined. Compared with *Chengtu* the coloring is more orange red and the mid-zone is more intense and more sharply defined.

Of the intra-bred selections for red from the wild parentage, the rule is that the flowers have narrow petals (see 6 in Plate 234) and sepals of such thin and tender structure that the perianth segments "roll up" in bright sun during hot days. In the hybrid selections mentioned above this defect is almost absent or not noticeable. Numerous seedlings of the scarlet-red color class are now under observation for evaluation.

It is, I believe, correct to state, that in the breeding efforts of the writer no plants with colors that match the best of the scarlet-red class have been obtained in lines of breeding indicated in Plate 232, unless there was introduced at least one parent of the scarlet-red class derived from the wild plants obtained from China.

The scarlet-red character, at least in homozygous condition, appears to be dominant over pink in hybridizations, but in the seedlings obtained there are gradations to many tints and shades between the various pinks as indicated by Ridgway and the crimson-red class. It may be noted that the scarlet-red color class approaches the spectrum red colors, that the range of shades of these same colors which approach black include the THERON CLASS, while their tints which approach white lead to the pink.

Brown coloring in daylilies. Shades and tints of coloring ordinarily described as brown, chocolate, and tan have appeared in daylilies. These colors are not closely matched by any of the color cards in the first 12 plates of Ridgway's Color Standards which show the entire range of 36 spectrum colors and their main tints and shades. It is necessary in matching the coloring in these "brown" daylilies to refer to the plates which show the "dulling" effects in pigments produced by admixtures of neutral gray. And in these the coloring is most closely matched in those plates in which either (1) red and orange or (2) orange and yellow are the main component colors. Brown color effects appeared in the flowers of some of the first hybrids obtained by the writer, especially when (a) *H. flava*, (b) some one of the fulvous daylilies and (c) orange-colored flowers were all involved in the ancestry. One such seedling, discarded in the early selections of the writer, was subsequently named *Brownie*.

The seedling which has been named *Brunette* has a mid-zone of coloring near madder-brown and a blade coloring of a lighter shade that may be called tan-red. This plant has in its ancestry a plant of series 145 (see Plate 232) which was hybridized with *H. Middendorffii*. Then one of this progeny was hybridized with *H. flava*. There was extreme variation among the members of the progeny that was obtained. The flower coloring included pale clear yellow, fairly good red, both orange and yellow plastid colors combined with various shades of fulvous coloring, and brown shades.

Daylilies with noticeable dull and brown shades of red have been obtained from the wild and especially in a collection of plants reported to be growing wild in Japan. The intra-bred offspring of these have been reasonably true to the color type. F₁ hybrids and later selections, especially when the *Lemon Daylily* was a parent, have given progeny whose flowers are still more brown-fulvous or tan-fulvous and in some of them the pattern is decidedly centric (no. 2 in Plate 233), which is a pattern quite new for daylilies. What is here called brown or tan coloring is more definitely brown than are the dull fulvous daylilies, as *Aurantiaca*, *Cypriana*, and numerous of the named horticultural clones.

Reduction in red pigmentations. A rather diverse lot of seedlings have segregated in various progenies which have faint red pigmentation. In some of these the pattern is semi two-toned and distal (no. 3, Plate 232) as in *Autumn Pioneer*. In *Boutonniere* the faint fulvous coloring is mostly in the petals and the pattern is faint bicolor and distal (no. 11, Plate 233). In *Dauntless* the pattern is almost a banded bicolor (no. 13, Plate 233) with the band rather large and broad but very

faint. The pale fulvous colorings exhibit the effects of reduction factors and they exist in each of the several classes of red color, in connection with the different plastid colors, and in many if not all patterns.

Spotted pattern in flowers of daylilies. A report regarding the origin of this pattern may be made here as it illustrates the origin of a color character that does not exist in the parents. Certain hybridizations between species which have *no* fulvous coloring in the face of the flower have given F_1 hybrids in whose flowers anthocyanin pigmentation appeared in minute spots scattered over the face of the flower. The parents were either (a) pure orange \times pure orange or (b) pure yellow \times pure orange. Not all the sister plants of any of these F_1 generations had the spotted coloring. Also there were wide differences among the plants which had the coloring; for some there were few scattered spots; for others the number of spots increased until, in the extreme, there were thousands of them in a single flower. The spots were usually most numerous in the mid-zone of the petals. In an examination with the aid of the microscope it was observed that as few as two and as many as 47 epidermal cells containing red sap pigments were grouped in a single spot of color. It would appear that there are wide differences in the total amount of red pigment produced in the flowers of these plants but that this is expressed in the number of the spots rather than in their size. If the number of spots should remain relatively few and well scattered but the area of each should increase in size then large-spotted patterns would perhaps appear.

Numerous seedlings derived from fulvous daylilies have flowers in which the fulvous coloring is flecked, scattered, or dispersed but each one of these conditions seems to be different from that of the spotted pattern mentioned above.

Genetically the spotted pattern is a new expression in that anthocyanin is produced in certain F_1 hybrids in positions in the flower in which such pigmentation is not found in either parent.

Concluding remarks. The several classes (a) of coloring and (b) of patterns in the flowers of daylilies that are here discussed are some of the more extreme and conspicuous of the developments in the red colorings of daylilies. In this report it has been the aim to describe these and to record the most important facts regarding their origin and genetics.

*The New York Botanical Garden,
Aug. 15, 1942.*

ADDENDUM

Since the last two sentences of the first paragraph on page 165 were written, a few seeds were obtained from the *aurantiaca* clone from self-pollination with the hormone spray known as Fruitone. —A. B. STOUT.

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DAYLILY BREEDING ROUNDUP

This is a continuation of similar symposiums published in 1940 and 1941 *HERBERTIA*. All daylily breeders who have not already reported should send in brief summaries of their work with daylilies.

EXCURSIONS IN DAYLILY ACHIEVEMENTS

ROBERT SCHREINER, *Minnesota*

During the past few seasons I have added over one hundred new daylilies to my collection, principally originations of Mrs. Nesmith, our Secretary, Mr. Hayward and Dr. Stout. In lesser numbers, but none the less important, I have added developments from the hands of Dr. Traub, Mr. Sass, Mr. Wheeler and Mr. Clint McDade. Many acquisitions have not blossomed characteristically enough to judge them as yet but those that have I have studied carefully and I have found many stunning, exciting new varieties. It is apparent that rapid progress is being made. The future prospects seem both encouraging and promising. As Dr. Stout pointed out in last year's *HERBERTIA* since large numbers of seedlings are grown there is greater chance for the rare recombinations of recessive hereditary factors and the new combination of complementary factors which are responsible for the expression of certain characters.

I do not believe in a complex color classification system. Rather I am interested in acquainting the average gardener with the newer Daylilies and the average gardener does not go at his work with the approach of a scientist. In my years of experience I have found a simple classification appreciated deeply. An elaborate color classification serves to

discourage before interest can be whetted. I roughly put my *Hemerocallis* in the following groups for the present time: Pale yellow, Golden yellow, Orange, Pastel, Rose, Red and Maroons. I will confine my article to the reds, pastels including "pinks" and bicolours.

However, I cannot neglect mentioning two or three of the best new yellows and golden yellows. Rather than obtain many yellow varieties I would concentrate on a half dozen of the best which would include *Hesperus*, a real achievement; striking *Moonbeam*, closest approach to white, a creamy yellow; *Nebraska*, rich soft apricot-orange, a beautiful color; *Patricia*, an earlier development of Dr. Stout's and a splendid plant; free flowering *Mrs. A. H. Austin* and indispensable *Hyperion* would be a very fine selection.

Before I mention some of the new colors I want to make a few observations on the color descriptions found in most catalogs and in many bulletins and magazines. My plea is for a simple, direct color description. To date I have not seen a daylily I could truthfully call purple as several new ones have been described. They tend toward that color but have not arrived as yet. To say a flower is Chinese pink or Jasper pink means nothing to the average gardener but to simplify it by saying it is a dusty pink or a chamois tinted pink would be a much more accurate picturization. I think the so called "pinks" have been given tremendous overemphasis. In my opinion there is no true "pink" *hemerocallis* as yet. *Fulva Rosea* is an approach but it is a rose red, very fine. *Sweetbriar*, a striking new variety is toned more rose than pink. When a flower lover anxiously awaits the opening of his "pink" *hemerocallis* only to find it chamois colored with only a tinting of pink he is keenly disappointed, particularly if he is picturing in his mind's eye a pink or rose tone as in *Lilium superbum roseum*. Many of these "pinks" I prefer to call pastels and among these I have found several creations I consider very fine lilies. These include the trio of *Piquante*, *Pink Lass*, and *Heather Rose* as closest approaches to pink. A delightful color of soft chamois is *Crystal Pink* and Stout's new *B. H. Farr* looks very interesting.

The shades of red and maroon are an interesting and fast coming group which I think are destined to be more popular than the "pinks" once they are known. Right now there is a great deal of confusion due to too many seedlings being named and introduced but inevitably the best will win out. Of this group I have been impressed by *Morocco Red* which I think is a real achievement in dark tones. It and *Purple and Gold* are two grand "maroon browns". I consider the name of the latter most unfortunate. There is an interesting variation in the reds from the rich maroon reds to fiery terra cotta reds. *Matador* is a stand-out, bright and gypsy-like. Just a shade darker, *Victory Taierhchwang* gave a brilliant effect. My choices of several interesting reds of Dr. Stout's include *Baronet* for its clarity and purity tho not large and two larger but more conventional red toned kinds, *Sachem* and *Dominion*.

I believe the widest interest is in the newest breaks in color. *Black Falcon* to date is about the darkest colored *hemerocallis*. The two remaining groups I would like to discuss briefly are the eyed group and

the bicolor group. These are provisional groupings and further acquaintance with these new color schemes may call for some shifting about. But among the varieties I am acquainted with I think the clear marking on contrasting yellow background of *China Sea* makes it a noteworthy variety. *Moonray* is as neat and trim a subject as I have enjoyed, very trimly marked. *Aladdin*, earlier blooming, zoned brown on light tan is very smooth and glossy. Not a large class I am looking forward to more of the interesting and promising new developments with sort of peacock feather markings.

A few years ago I blossomed *Bold Courtier* and I was immediately impressed by this handsome bicolor. Today it is one of the standards in any collection. By far the most vivid, striking new Hemerocallis of this pattern group to bloom was Mr. McDade's *Jean* a beautiful contrast of rich orange and rich red velvet. It is very brightly colored, very large and ruffled. Best visualized as a far better *Festival*. Mr. McDade has a unique series of bicolor types I will mention just a little later. *Su Lin* of Mrs. Nesmith is a lovely sort of ashes of roses and yellow bicolor. Dr. Stout's *Bicolor* as it flowered for us was small flowered and not patterned as exact as the description seemed to imply.

There is universal interest in extreme late flowering Hemerocallis as witness the interest in Multiflora and its hybrids. Mr. McDade concentrated on developing a series of later flowering varieties and his efforts were very successful in the creation of an entire series of late blooming bicolor varieties. He has named this series the Bright Morning Series and has selected seven of the most striking variants. The series is characterized by trumpet shaped blooms with yellow petals and various registers of red colored sepals from light to dark. Were they not valuable for their extreme lateness and their size they would be valuable for their color patterns alone.

In closing I just cannot neglect mentioning a few highlights that impressed me as being distinct and unusual. For broad petals and a full flower *Chloe*, a sanded and peppered sepia on light tan is a splendid sort. *Burning Star* is a bright, very narrow petalled type, pretty and novel. Diverse petal formation is interesting because it breaks the monotony of uniformity. *Duchess of Windsor* has very broad full petals and a lovely flower. *Yellow Tulip* has upright flowers suggesting a tulip. For color, *Minnie*, not large, seemed very much out of the ordinary, very rich deep, velvety maroon. It is one of the finest of Mr. Hayward's seedlings I have flowered and he can well be proud of it.

My own hybridizing is strictly experimental. Nothing has been achieved that is finer than already existent material in commerce. The war will seriously curtail any hopes of further experimentation but I do hope to keep abreast and add the new, promising creations as they are offered. I think it only fair to call attention to the fact that the scope of my review here is limited by space so omissions of worthy kinds is not intended. This paper is meant to review only interesting new developments as they have performed for me here in our Minnesota climate.

WHY I BREED DAYLILIES

CHAS. E. F. GERSDORFF, *Washington, D. C.*

I now breed daylilies for the same reasons that led me to breed, in order, roses, garden chrysanthemums, dahlias, gladioli and irises, because of my keen love for flowers of all types, the healthful outdoor exercise, and the pleasure in having produced something very impressive to others or which satisfied my wish for something different. To only grow the products of others' skill did not satisfy, nor could my small purse be stretched to the limits of my desire for plant material.

Continuing my efforts in iris breeding but on a much smaller scale than in the past, I began breeding *Hemerocallis* in 1935 in an endeavor to increase the color range in the small low types as well as in the large tall ones in which I also saw the need of better branching, better substance and increased lasting quality of individual blossoms.

My original collection for many years to 1932 comprised of *H. citrina*, *Flavina* (both now discarded), *flava* which died out, *fulva* (salmon overcast fulvous, veined darker, orange throat ending in a dark reddish star, slight fragrance) in quantity but now whittled down to two clumps, *kwanso*, *aurantiaca* (small, 24", May-June, orange yellow with orange red reverse), *Middendorffii*, *Dumortieri* and *Thunbergii*. Through the kindness of a friend in 1932 I added *Radiant*, *Orange Glow*, *Apricot*, *Goldeni*, *Gypsy*, *Sovereign*, *Lemona* and *Golconda*, all recently given away because I liked certain of my own seedlings better or and I needed the space; also *Calypso*, *Bay State*, *Cressida*, *Lemon King*, *J. R. Mann*, *J. A. Crawford*, *Sir Michael Foster*, *Amaryllis*, *Mary Florence*, *Hyperion*, *Florham*, *Margaret Perry*, *D. D. Wyman* and *Golden Dream* (the last was destroyed by cats just after gathering numerous seed). These actually were the incentive toward breeding daylilies in 1935. In 1941 I added mostly for comparison purposes, color, size and branching (?), *Cissy Guiseppi*, *Dawn*, *Sunset*, *Sunkist*, *Imperator*, *Sir William*, *Bardley*, *Moonstone*, *Gracilis*, *Nebraska*, *Moonbeam* and *Star of Gold*, and in 1942 *Viscountess Byng*.

Of my first crossings none were saved. There were a few retained in 1937 of the low growing small sorts, 45 in 1940 and re-selected in 1941 and 42 in 1942. Those of 1942 remain in their seedling boxes on the roof of my home, with careful watering and fertilization until 1943 for re-selection. Though I sometimes plant soon after harvesting the seed to October, I usually prefer early March planting.

Most are planted in "California-grape boxes" on my slag finished roof—bottoms lined with peat moss, then fine loamy soil to fill the box to within two inches of the top, mixed well with superphosphate of lime, on which the seed are planted to stand one to three inches apart depending on quantity on hand, lightly covered with peat moss, then more soil, fertilizer and topped with half an inch of peat moss and given a thorough soaking, primarily to fix the peat moss dressing so it will not blow away—watered as needed. The garden seed plots are similarly constructed. The boxes average a depth of five inches, and the root growth

here is much more vigorous and prolific than in the garden proper. I obtain bloom in the boxes from one to three seasons after germinating, frequently in one year, but mostly in two.

My seedlings were derived from the use of *aurantiaca* (?), *Gypsy*, *Radiant*, *Sovereign*, *Thunbergii* and *Flavina*, mostly small and low growing, and taller large ones from the use of *Golden Dream*, *Calypso*, *Lemona*, *Sir Michael Foster*, *Cressida*, *Hyperion*, *J. A. Crawford*, *Amaryllis* and certain selected seedlings. I made my most crossings in 1942, mostly amongst my own seedlings, or these with a few others and find myself swamped with seed so that I will have to bloom these before breeding more of them, as my place is small.

All seedlings retained receive tentative names as numbers after once blooming are confusing to me. There will be continued replacements as new seedlings show to better advantage.

I discard by giving to people who normally would never buy plants, because I feel that these gifts either give pleasure to less favored people, or to some who are yet but novices and in time will through these gifts aspire to better named varieties.

Though I feel I have made progress in my short period of breeding, it is yet too early to say much about my seedlings except to mention a few developments in my roof garden which were unusual to me and might prove of interest to others. This year several seedlings from various parents, some of selected seedlings, have developed new plants on the stalks where normally buds or bud branches would or did appear. Some developed roots before removal, all are growing. I have rich orange to orange red tones to near flame scarlet, also very light yellows to light greenish yellows, seedlings that open at midnight, 1, 2, 3, 4, 5, 6 A. M., 3, 4, 5, 6, 8, 9, 10 and 11 P. M., blooms lasting 18 to 35 hours. Some show branching. Two clones from different sources had in three and two years from germination, respectively four and five divisions each with a bloom stalk, flowers only fair in size. One in 1942 growing in four inches of soil in a grape-box also containing two seven-year old iris clumps, has wide wavy very dark green foliage, luxuriant growth, a stalk of 40 inches, stiffly erect, high branched, which developed 44 buds opening to full blooms of *Amaryllis* form and $3\frac{3}{4}$ to 4 inches, in pale lemon yellow to oil yellow throat (Ridgway)—two years from germination. But one fan of foliage at blooming, now has two and was bodily lifted to a deeper box without a setback for bloom again on the roof. Sun resistant and the stalk bloomed for an entire month, out of *Lemona* x *Calypso*.

THE RUSSELL DAYLILIES

H. M. RUSSELL, *Texas*

I was born in Wheatland, in 1901, a little town situated in the Indian Territory which, of course, has since become the State of Oklahoma. I am the youngest of ten children. My father, J. T. Russell, was the originator of the "Russell Big Boll Prolific Cotton", and had just moved West and established our home. When I was four months old my father

died. In one year my father produced forty-two bales of this Russell's Cotton on fourteen acres of unirrigated land and I have in my possession unimpeachable records to that effect.

Two years after my father's death my mother moved her family back to Alabama. Before I finished the sixth grade of school I quit and went to work. For more than twenty years I was engaged in the general nursery business in Alabama, Georgia, and South Carolina, and during this period, to a small extent, I worked with daylilies. I produced some very fine varieties many years ago that were never released through a catalogue to the general trade but were sold and planted on large estates. Twenty-seven thousand of these plants went on four landscape projects. Eleven thousand were planted on the Charles Urschel Estate in Oklahoma City.

When I decided eight years ago to abandon all my other work and go in exclusively for the breeding and growing of daylilies I spent several years collecting species as well as the best hybrids and moved all the stock, more than fifty thousand plants, from Sumter County, South Carolina to Texas. My nursery is located at Spring, Texas a little town twenty-three miles north of Houston, where I am now growing more than 250,000 plants on a twelve acre farm. I have spent much time in the past few years breeding for giant bi-colors and early blooming varieties in darker colors. I now have varieties in purples and reds that bloom as early as the earliest dwarf yellows and of course I am, as well as everyone else I suppose, working for continued bloomers, and those that remain open at night. I know of no one else in this field who professes to make a living solely from daylilies and I have been doing this now for more than eight years.

I have five children, and my oldest son, Jake, who is fourteen has crossed daylilies for seven years and with a definite purpose. He knows several hundred varieties by sight.

DAYLILIES IN ARKANSAS

J. W. HOUSE, *Arkansas*

There are quite a number of flower growers in Arkansas who have been hybridizing Iris for several years and there are some very fine collections of tall bearded Iris in this State. Daylilies, however, have been confined to the roadside variety, and they have not gained the popularity that they deserve up to the present time—although I think that in a few more years they will be equally as popular as Iris.

I have a few acres not far from Little Rock, which are devoted exclusively to flowering perennials shrubs. Not having any facilities for watering, I have to depend on perennials, which are principally Iris of several species, peonies and gladioli.

About four years ago I became interested in *Hemerocallis*, with a view of prolonging my blooming season, and on the first day of August this year I had about fifteen daylilies that were really a pleasure to see, with several later blooming varieties yet to flower.

After becoming interested in hybridizing daylilies, I undertook to secure a representative collection of the new varieties; and, last year and this year I had enough modern material, I believe, to enable me to at least raise a few swans. I found that a very convenient way of hybridizing is to take a small medicine bottle about 1 to 2 inches in length and $\frac{1}{2}$ to $\frac{2}{3}$ inches in width; and, with a pair of tweezers, pinch off the anthers from the desired bloom and drop in the bottle until it is about two-thirds full. In a short time the pollen will dry and cling to the sides and accumulate in the bottom of the bottle. Then take the flower you desire to pollenize, and push the stigma in the bottle opening and along the inside of the bottle, and it will accumulate an abundance of pollen in this manner. This is much faster than undertaking to separate the pollen by putting the anthers in paper trays. In this way, I selected my best "Reds" and put the anthers in one bottle and the best "Yellows" in another bottle and I could make crosses conveniently and very rapidly in this manner. The same pollen can be used several days if the bottle is left open. I have approximately two thousand seedlings from this method of crossing.

THE NIES DAYLILIES

Mr. Eric E. Nies, landscape architect, teacher of botany, biology and agriculture in the Los Angeles City Schools, President of the Hollywood, Calif., Garden Club, breeder of iris, particularly in the bearded, spuria and Louisiana groups, writes that he has been breeding daylilies for a few years, using the available commercial offerings as his breeding stock. He is the originator of the *Rosy Day* Daylily described elsewhere in this issue of HERBERTIA. —H. P. T.

5. PHYSIOLOGY OF REPRODUCTION

PROPAGATION OF ALSTROEMERIDS

HARRY L. STINSON, *Washington*

The literature on the subject leaves much to the imagination as to just how to propagate the various species of the alstroemerids, aside from the generalization that they may be propagated by seedage and plant division.

Seedage is a much more rapid method of increasing the stock but has the disadvantage, if seeds from open-pollinated flowers are used, of not being able to control the colors desired. When flowers are cross-pollinated by bees and humming birds they come about 90 per cent true to color from field run of seeds. No attempt has been made to control the results as to color by hand pollination except in the case of one or two choice colors, and even they showed some variations.

If seedage is to be the method employed to increase the stock, one must first catch the seeds. I mean that literally for one must watch just when the seed is mature and each morning go over the capsule to see which are ripe or else when the sun warms them up and they are perfectly dry they will dehisce with such force that the seeds will be scattered several feet. So again I say catch your seed before you plant it*.

The seed beds should be prepared well in advance of the time to plant the seeds, so that the soil may be as friable and mellow as possible. This extra precaution at this time will save your temper and the tubers at harvest time. I find a bed about eight to twelve inches deep to be ample. To this is added peat moss, leaf mold or other humus until the soil will not pack solidly about the tubers. In this the seeds are planted one inch deep sometime during the months of October or November. The seeds will not germinate during the warm months so nothing is gained by earlier planting except for convenience. Frost does not seemingly injure them, for seeds scattered on the ground last fall survived a 16° F. freeze for several days, germinated and grew vigorously. Seeds planted at this time will make good growth and a few will bloom the first season. As soon as the tops die down the plants may be dug, which is usually during the latter part of June or early July. These "tubers" I generally use for planting stock, or I select out the larger to be sold as seedling "tubers," which do credit to themselves.

Alstroemeria seeds must have the sun to germinate, while *Bomarea* seeds must be protected from the direct sun or else they will not germinate. These latter are started by placing two or three seeds in a three inch pot and placing it in a warm location in the shade sometime during the month of June. The seeds of the tender species start readily if sown in a warm situation, and given some protection from the hot sun. The seedlings should be replanted when they become dormant.

*It is possible that the whole plant stalk, including the near ripe seed capsules, could be harvested and placed in a container so that the ripe seeds would be collected at the bottom. Experiments with only a few stalks of *Alstroemeria psittacina* at Mira Flores, Orlando, Florida, in 1939, seem to bear out this theory. Brown paper bags were used as containers.—Ed.

The types of crown, rhizome and roots of a few species of *Alstroemeria* are shown in the illustrations. Figure 80, left, shows the underground portion of the *A. aurantiaca* plant; on the right of the same Figure, these same parts are shown for *A. chilensis*. Figure 81 shows the underground parts of *Alstroemeria pulchra*. The underground portion is commonly called "tuber."



Fig. 80. Rhizomes and roots of *Alstroemeria aurantiaca*, left; and *A. chilensis*, right. Photo by Harry L. Stinson, Seattle, Washington.

Propagation by plant division is a much slower method of increasing stock but the only positive way, in the absence of inbred elite lines, of preserving a definite color. When a desired color shows up in the seed bed, dig down carefully along the stem until the attached "tuber" is located, and this is then planted separately. To control the "tubers" and make the digging of them easier I hit upon the method of using five gallon cans. The top and a side are removed and the open ends placed

together so that they form a long open trough. This is filled with good soil, the "tubers" are planted on the top, and the entire lot buried six or seven inches deep. After blooming the next year, the plants are dug up and carefully removed from the cans, divided and again replanted. Large pots would do equally as well, but the cans are available at no expense.

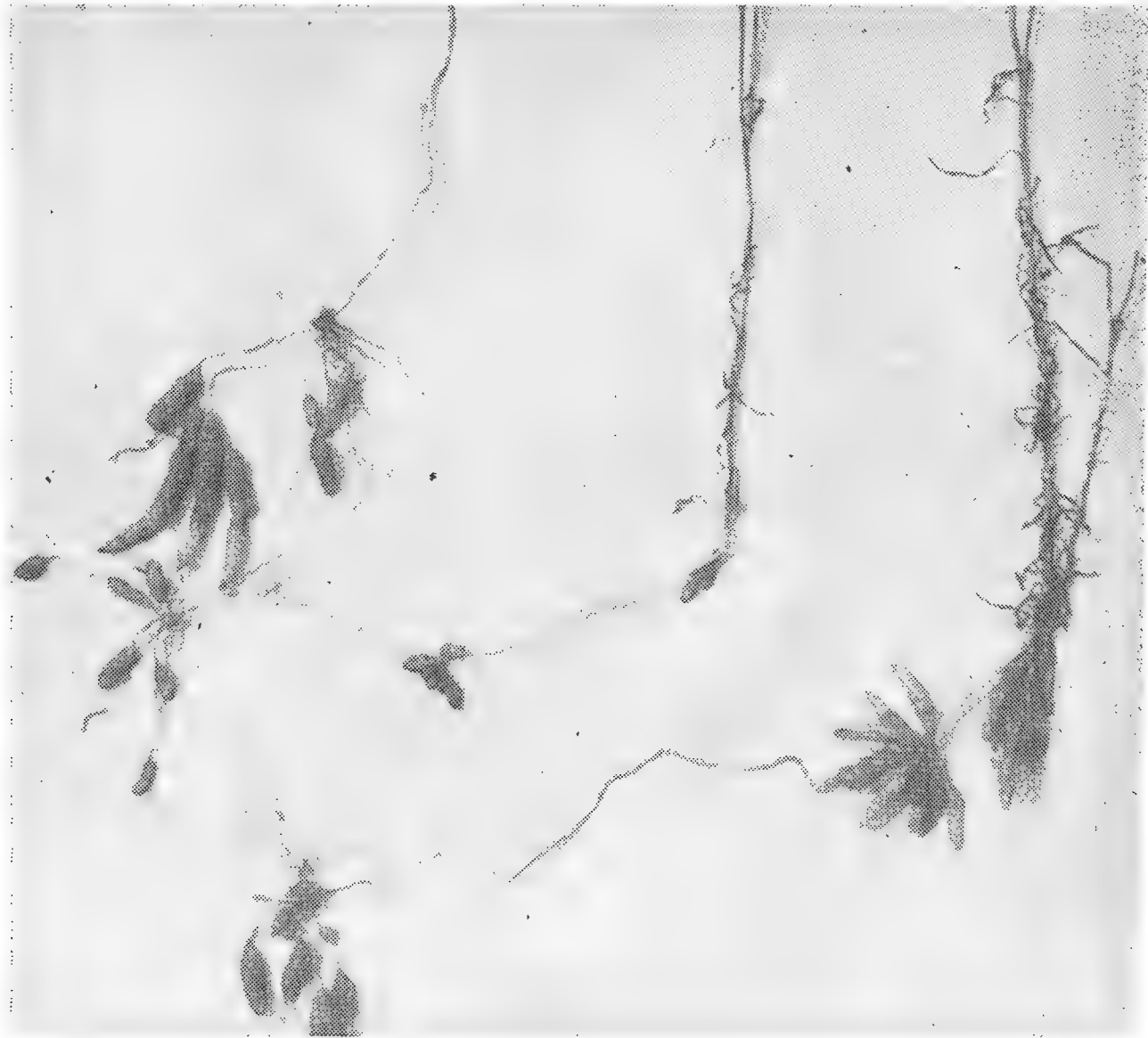


Fig. 81. Rhizomes and roots of *Alstroemeria pulchra*. Photo by Harry L. Stinson, Seattle, Washington.

Bomareas are increased by division in the same manner. At the time when they seem to be at their lowest growth the plants are carefully removed, divided and planted in separate cans.

ALSTROEMERIA & BOMAREA FROM SEEDS

L. S. HANNIBAL, *California*

Of all the Alstroemerids, a mixture of *Chilensis* hybrids, which includes the tall *Ligtu-Angustifolia* forms, offers about as much diversity of form or color in the pastel shades as anyone could desire from any one group * of plants—for one can find shades running from near white

* The writer prefers to group all the Chilean types with the highly compound umbel as one. It matters little if one takes a group of selected hybrids, or a number of plants from the wild, the attempts to key either would result in a botanical headache of the same magnitude. Many intermediate forms exist in the wild which have led to much confusion. Unless some specific characteristic of growth habit such as the quack-grass nature of **pulera**, or the refusal of a form such as **violacea** to cross, can be detected, little reliance can be placed on leaf shape, flower color or form of compound umbel for species identity when these factors are so variable—even the experts are confused. Plants can be selfed and bred fairly true, but a mixed group accessible to bees or wind for pollen distribution can present some interesting forms which may involve **versicolor**, **Ligtu**, **Haemantia**, **pelegrina**, possibly one or two other apparent species.



L. S. Hannibal, Concord, Calif.

*Alstroemerias naturalized at the University of California Botanic Gardens,
Berkeley, California*

to straw, yellow, ochre, orange and pink, rose or any intermediate tone desired. In most cases the 20 to 50 blossoms which occur in a single umbel is sufficient for a complete bouquet of its own, and a branched pedicel with two or three bloom on it will rival any orchid for a corsage. The fine keeping quality as a cut flower has made this group a popular one during the summer with a number of West Coast florists. These plants are truly coming into their own.

The *Chilensis* forms are not difficult to start provided one can give them their desired environment. They can readily stand 10-15 degrees winter frost with mulching, but they will not tolerate summer ground temperatures much above 70 degrees F. while in growth. This latter condition may make them difficult to handle in So. California or Florida, but in the Pacific Northwest, or along the Atlantic Coast up to Long Island this group makes a beautiful showing. The tuberous roots can be planted in the fall in a rich, well drained loam where the plants establish themselves quite readily, but the best bloom seldom appears until after the second year. Plants from seeds, which the writer prefers, are equally as suitable. One requirement is that the seeds must be fresh, the other is that a well drained light humus be used for planting. In near frost free areas the seed can be sown in place as soon as received in the fall; otherwise it is best to use seed flats in some protected shelter where moisture and temperatures can be controlled. Some seed may germinate in the fall, but most of it will carry over to March or April before the first leaves appear. When about three weeks old the seedlings can be lifted from the flats and placed in individual 4" pots, and as soon as danger of frost has entirely passed these plants can be placed outdoors, either by plunging the pot 2" deep, or by transplanting—the latter being best. A few flowers may occur the first year and indicate the color of bloom, but it takes another year to get a mature plant, where the flowering quality may improve some 300% or more. After flowering, the *Chilensis* hybrids usually go dormant, or if the ground temperatures exceed 65 degrees F. they may go dormant even before the floral stalks completely develop, especially with young plants in pots. This condition has been experienced a number of times by the writer when delay occurred in moving young potted plants from the greenhouse to outdoor beds.

Root crowding is another condition that checks the growth of *Alstroemeria*. If winter conditions are such that potting is essential use a pot of 7" or larger as soon as growth starts the second year, or better use a half nail keg. A crowded plant will never bloom.

Some of the seeds of other *Alstroemeria* species such as *pulcra*, which spreads by stem nodes at the surface of the ground like quack grass, or *psittacina* (*pulchella*), the Parrot Flower, require the same treatment as the *Chilensis* hybrids for seed culture, but *pulcra* (See Fig. 82) and its variations are not quite as winter hardy and need more protection.

Pelegrina forms and *A. violacea* are warm climate plants and the seed needs a sandy soil, not too moist at 50-60 degrees F. for germination. In contrast the seed of *A. aurantiaca*, the evergreen species with the big yellow blossoms, gives some difficulty—Mr. James discussed this

problem some time back. The seeds require cold treatment at 45 degrees F. or less, in other words: stratification. Here in central California they can be sown in the open where the winter rains and mild frosts seem to be what's desired, for every seed seems to grow. This species is exceptionally hardy and has a longer flowering period than other varieties. Its umbel is not as large as some of the *Chilensis* forms and is preferred



Fig. 82. *Alstroemeria aurantiaca*. Photo by L. S. Hannibal, Concord, Calif.

in some flower arrangements for that reason. It is an excellent plant for naturalizing.

Alstromerias have been known in this country for some time. Mr. Gordon Ainsley had them in his garden 12 or 15 years ago at San Jose, but the bomareas are something new. A half dozen species are possibly on the market. In general these are jungle plants that like shade, a deep mulch, humid conditions, and no winter frosts. The seed of these plants require warm moist conditions for germination whereas alstromerias favor the early or midspring temperatures. *Bomarea ovata*, which is quite widespread in Central America and notoriously variable in form, requires much warmth. *B. edulis*, *B. costaricensis*, *B. caldasinia*,

and *B. salsilla* require similar treatment, but *B. acutifolia* and *B. frondea* need milder temperatures. Incidentally *B. frondea*, which was distributed in '41 by the U. S. D. A. promises to be a very hardy plant. We hope its bloom is equally as attractive.

The fruits of *Bomarea* are often as interesting as the pendulant bloom. They are unlike *Alstroemeria* in that they hang from the vine for some time after ripening with the large red capsules resembling *pittosporum* seed with their split pods. When gathered fresh they can be stored dry for 6 or 8 months without harm, but old seeds that have been exposed to winter weather is seldom viable, or is slow to start.

Bloom are seldom had on *Bomarea* until the plant is well established. This usually occurs in the third or fourth year and unlike *Alstroemeria*, the leaf and floral stems are not readily distinguishable. Usually the flowering period extends over most of the summer. Little is known regarding hybrids in this group, but apparently there exists an interesting future here. The best collection on the west coast is at the University of California Botanical Garden (See Plate 235) where a number of plants are grown in shade along with Azalea under oak trees, or under lath, where several new species await identification.

Neither *Alstroemeria* or *Bomarea* have many pests. Green aphids have been observed on some varieties in early spring and moles may attack the tubers. Occasionally a form of chlorosis may appear and then the flower parts all revert to vegetative growth. This plant family is not poisonous to stock; in fact the tubers are said to be quite edible although not too tasty. Has anyone tried *Alstroemeria* salad?

SOME OBSERVATIONS ON CROWN CUTTINGS OF HEMEROCALLIS

V. T. STOUTEMYER

Bureau of Plant Industry, U. S. Department of Agriculture

The comparatively slow rate of increase of daylilies after a desirable variety has been developed has been recognized as one of the major obstacles in breeding and improvement (1). Desirable daylilies have sometimes remained scarce and relatively costly for a decade after introduction. On the other hand, with bearded iris and many other popular perennial ornamental plants when a desirable form is introduced, the price declines in a few years to a sum which permits wide dissemination to the average gardener.

The possible vegetative methods of propagation of daylilies have been summarized by Stout (3). The method of crown cuttage as introduced by Traub (6) (7) (8) has been particularly useful in the multiplication of rare sorts. In this procedure, the crown, leaf cluster or fan and attached portion of the rhizome or root system are divided vertically in halves, quarters or even smaller portions and are placed in a rooting medium of peat and sand or other suitable material until new shoots and roots have started. This procedure is best carried out in a greenhouse, lathhouse or frame. The plants may be potted up and grown on

until large enough to be planted out in the nursery. Certain questions regarding the most favorable frequency of division and other points of procedure remain uncertain at present because of the lack of experimental evidence.

Observation of the abundant sprouting from the crowns following occasional winter injury of evergreen sorts suggested the trial of crown cuttage in the nursery row. Hayward (2) has described a type of vegetative propagation in which fans were carefully removed from the rhizome which was left intact in the soil. Sprouts arose at the cut portion of the rhizome and could be used for multiplication later.

The following experiment was conducted with a modified form of crown cuttage in which the soil was pulled away from the bases of young new leaf clusters in the spring. These were then slit longitudinally into



Fig. 83. Plants of daylily clone *Meehani*; left, control; right, plants under six hours additional day length showing increased growth. (U. S. Dept. Agric. Negative No. 79,693).

halves, cutting through the attached portion of the rhizome or root system also, but not disturbing the feeding roots. This procedure avoids the violent shock to the root system involved in the standard procedure for crown cuttage. The absence of special equipment and the freedom from constant attention were advantages which seemed to justify an outdoor trial of this variation of crown cuttage.

In the following experiments, four selected clones of *hemerocallis* were used and were treated according to the above procedure on April 22. These clones were seedling selections derived from crosses made by Mr. B. Y. Morrison. The plants had been started from single-eye divisions made in the previous season. At this date all of the plants were in vigorous new growth and in most cases each plant had two fans or leaf clusters. The plots were laid off along the nursery rows, each con-

taining 10 experimental plants. In each clone, two plots were used for the control and two for the treatment. The plot arrangement as limited by the original planting was admittedly not ideal from an experimental viewpoint, but the soil and site conditions on this area were believed to be quite uniform.

By the end of May, most of the treated plants had recovered from the slitting and were producing new shoots. Later, flower stalks were usually produced in nearly as great abundance and height on the plants which had been cut as on the controls. However, the clones behaved in a diverse manner, and in No. 10704-B the flowering was greatly diminished by the treatment.

Since many commercial growers prefer to lift and ship hemerocallis in August, in this experiment the fans were counted on August 1. The results are shown in Table I.

Table I
Response of Various Daylily Clones to
Crown Cuttage in the Nursery

Clone	Parentage of Clone	Number of fans per 10 plants			
		Control		Crown Cuttings	
		Lot 1	Lot 2	Lot 1	Lot 2
10704-B	Leo x H. aurantiaca major	50	57	71	73
10732-C	Margaret Perry X. Meehani	37	46	60	50
10746-D	(Florham x H. Middendorffii) x H. aurantiaca major	39	39	74	71
11790-A	(Margaret Perry x H. aurantiaca major) x (Florham x H. Fulva)	35	48	52	46

The data presented in Table I show that the treatment usually caused an appreciable increase in the number of growing points, although the response varied greatly according to the particular clone. Thus the treated lots of 11790-A had practically as large fans as the control lots but the increase in number was slight. On the other hand, with 10746-D the fans in the various treatments were about the same size, but the number was almost doubled by crown cuttage. The treatment was clearly advantageous with this clone. Clone 10704-B responded in a still different manner. The number of growing points was increased but the diminution in the size of the fans was sufficiently great to nullify this advantage. Clone 10732-C likewise did not respond satisfactorily to the treatment. Except with one clone, the results of this experiment were hardly promising enough to warrant the use of this method of crown cuttage in the nursery row.

One experiment conducted with crown cuttings handled in the conventional manner indicated that the use of supplemental electric light is highly advantageous in speeding up the growth and reproduction of hemerocallis, when a greenhouse is used to maintain growth of especially valuable sorts over the winter and thus secure a rapid increase of stock. Evergreen varieties may be maintained in practically continuous growth indoors, but the deciduous varieties will start more evenly and make better growth if a period of dormancy and exposure to cold precedes the period of forcing (4). Daylilies should be potted in a rich soil, high in organic matter and should have abundant watering when grown indoors.

The remarkable increase of growth obtainable by supplementary

lighting was demonstrated by the following experiment. On October 1, clumps of the daylily variety Meehani were lifted and the individual fans were cut in two. Each portion or crown cutting was potted directly in a mixture of composted soil with abundant leaf mold and sand. Each crown cutting produced one or two fans during the early part of the winter. On Feb. 1 of the following year 32 of these plants which had single fans were selected for uniformity and divided in two lots. At this time the plants were growing in five inch pots. The plants were placed in the center of a greenhouse kept at 50-55° F. night temperature. A 100 watt incandescent light in a large dome reflector was placed over one lot of the plants and a screen was used to prevent any light from reaching the control lot. The pots were moved at weekly intervals to minimize effects of position. The light was turned on from 6 P. M. to midnight daily for six weeks by means of an automatic time switch. The plants receiving the additional light soon surpassed the check lot in vigor. The appearance of the plants under the two treatments is shown in the accompanying illustration. Stuckey (5) obtained a similar increase in length of leaf with orchard grass grown under increased length of day.

At the end of the period the plants were removed from the pots and the roots and tops were weighed individually. The summarized data, based on green weights, for the two lots are shown in Table II.

Table II
Response of Hemerocallis to Supplementary Light

Portion of Plant	Treatment		Increase in weight (grams)
	Control (Weight in grams)	With supplementary light (Weight in grams)	
Tops	348	689	341
Roots	785	833	48
Combined	1133	1522	389

Obviously the great increase was in the leaf development of the tops, since the green weight was nearly doubled and the plants were almost twice as tall. The mean difference of the weights of tops of treated and untreated plants was 341 plus or minus 9.75 grams. Since with 30 degrees of freedom in the two lots of 16 plants each, $t=2.750$ for odds of 99 to 1, a difference of only 26.8 grams would be highly significant. The increase in the development of the extensive storage root system of the plants was scarcely under way at the termination of the experiment, but doubtless the greater photosynthetic area of the plants receiving supplemental light would have caused a marked increase in the root system if the experiment had been prolonged. More than 16 plants could have been accommodated under the light and since only slightly more than four kilowatt hours of electricity were consumed weekly, the expense of the treatment could be justified for working up stocks of a new and valuable variety of daylily for introduction, particularly in the early stages of propagation.

Plants of most varieties of daylilies started into growth in the greenhouse usually grow well after planting outdoors and will bloom normally, although the date of the flowering season will be altered. Care

must be taken to avoid a checking of growth which may cause the plants to become semi-dormant for a certain period, thereby losing some of the advantage gained by growing under glass. Stout (4) noticed that if daylilies were grown continuously through the winter and spring in the greenhouse, the vegetative growth of the plants tended to be irregular and discontinuous during the following summer. Some additional information on the problems of greenhouse propagation is needed. Furthermore, the factors affecting the rate of propagation outdoors are not known well. However, an abundant supply of water and a soil with a reasonably high fertility and content of organic matter appear to be important factors in speeding up growth and natural increase in the nursery.

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Harry L. Stinson, Seattle, Washington

One of Harry L. Stinson's fields of Alstroemeria chilensis in flower, upper; Alstroemerias cut and placed in deep water before packing and shipping to San Francisco World's Fair, lower.

6. AMARYLLID CULTURE

REGIONAL ADAPTATION, SOILS, FERTILIZATION, IRRIGATION, USE IN LANDSCAPE, DISEASE AND INSECT CONTROL, ETC.

CULTURE OF THE ALSTROEMERIDS

HARRY L. STINSON, *Washington*

Although Father Feuillet, Ruiz and Pavon, Poeppig, and various other travellers do casually mention the growing of the alstroemerias in certain localities this information is so meager as to the horticultural aspects of these localities that we are given little or no tangible clues as to how, when, where, and under what conditions they grow in their native habitat. Linnaeus wrote that Alstroemer did find them growing in the garden of the Swedish consul, Don Bellman; Feuillet intimates in his preface to his description of *A. pelegrina* that because of its beautiful flowers it must surely have been grown in the wonderful gardens of the Inca Kings. Ruiz and Pavon add a sentence in their observation that *A. pelegrina* was grown in earthen pots in the gardens of America and Spain for the beauty of its flowers. More recent writers have been a little more considerate of the horticulturist for they write a little more in detail as to how and where they find them growing.

The culture of the hardier alstroemerias presents very few difficulties to the gardeners in and around Puget Sound and similar climatic regions (See Plate 236.) The winters in this region are usually cool and damp with some fog and misty rain and with sun-shiny days interspersed. Generally the temperature seldom drops below 40° F., however sometimes it does go down to 6° to 12° F. and the ground freezes down to a depth of four to six inches. At these times the *Alstroemeria* beds must be mulched to prevent the frost from going deep enough to reach the "tubers," which would be fatal to them. The tops will freeze off but new ones will soon replace them. During the summer season the temperature ranges from 60° to 90° F. during the day and cooler at night. These conditions seem to be much to the liking of the hardier alstromerias for they grow to a height of four to five feet without any special treatment other than that given to other perennials.

To obtain the optimum results select a location where they may remain planted for several years without being disturbed as they resent transplanting. This location should be well drained and yet remain damp and cool during the summer months. A soil which is inclined to be on the clayey rather than on the sandy side of a loam is to be preferred. A clayey soil remains cooler than a sandy one and they appear to resent a hot and dry situation. At this latitude they do better in full sun, although they will tolerate some shade if intermittent. Further south where the sunlight is more intense possibly more shade will be required. To this soil should be added a heavy application of completely decomposed barn-yard fertilizer, compost, or leafmold and thoroughly integrated into the soil to a depth of twelve to eighteen inches. In this the tubers may be planted at least six inches deep and ten to twelve

inches apart sometime during the months of August or September, or not much after the first of October if the maximum of flowers is to be expected the following year.

In the colder sections of the country where the ground freezes more than two or three inches deep, they should be given the protection of a mulch or placed in a coldframe and covered during the severest part of winter so that frost does not penetrate to the tubers, which is fatal to them. The sterile stems start appearing during December or January



Fig. 84. Mrs. Stinson and daughter with Alstroemeria corsages. Photo by Harry L. Stinson, Seattle, Washington.

and are more or less immune to frost and even if frozen off the results are not disastrous for others will soon come through the ground. After the first year or two when the tubers become established they bury themselves so deeply in the ground that the danger from frost is minimized. I have seen *A. aurantiaca* growing almost on the summit of the Cascade Mountains but here they are protected by a heavy fall of snow before the severe freezing weather is experienced.

In case your soil is on the sandy order it would be well to mulch with peat moss or alder sawdust so as to hold moisture and prevent the soil from becoming dry and hot, or plant among other perennials such as peonies or open shrubbery which will shade the ground. I have heard of a gardener in the South who covered the bed with the prunings from peach trees through which the alstroemerias grew and afforded both shade and support.

The floriferous stems appear above the ground during the early spring and grow very rapidly until they flower during the latter part of June and into July. By this time the sterile stems have died down and as soon as the flowers are gone the tops may be removed unless you wish to save the seeds. A continuity of bloom may be had by planting shallow rooting bulbs such as tulips, daffodils or Dutch irises, which bloom and are gone by the time the *Alstroemeria* needs the space. For late bloom some of the taller lilies may be used.

The semi-hardy species of the alstroemerias have to be grown in coldframes or a cool greenhouse and given some heat during the severest part of our winters. After the danger of frost is past the coverings are removed for alstroemerias dislike being under glass or in confined air. The tender species must be protected from frost at all times. In a frostless region they may be grown out in the open but with us they must be grown in a cool greenhouse.

The culture of bomareas is still very much in the experimental stages although I have had very gratifying results. The bomareas are indigenous to temperate regions of the tropical forests and this gives a suggestion as to their cultural needs. The forests afford shade and the forest floor has an ample supply of leafmold as a growing medium. With these factors as a basis I take about one third each of leafmold, compost and garden loam for a potting mixture. They require a rather deep rooting space. I plant them in five gallon nut cans which can be shifted from place to place to suit our changing seasons. These are placed in the greenhouse during the cold winter months and with the approach of spring weather they are shifted to a lath-house for the summer. In these containers and under these conditions they appear to be perfectly happy and reward me with luxuriant growth and many clusters of their rich golden bells.

Alstroemeria blossoms are distinctly valuable as cut flowers since they are long-lasting (See Plate 236). They also make very attractive corsages (See Fig. 84).

NATURALIZING NARCISSI IN MISSOURI

EDGAR ANDERSON, *Geneticist*

Missouri Botanical Garden, St. Louis

The Arboretum of the Missouri Botanical Garden is at Gray Summit, Missouri well outside of the metropolitan area of Saint Louis. It is designed mainly to supply those features of a well-rounded botanical garden for which there is not room in the city or which can be carried

on more successfully in the clear country air. It has among other features a pinetum, a wild-flower reservation, and an orchard of oriental crab-apples all of which are made available to the public by a gravel road which winds for two miles between rail fences. Along the fences, in the meadows behind them and in the pinetum Narcissi have been planted from time to time during the last 15 years. They have done so well and created such a beautiful and interesting display that in recent years the Missouri Botanical Garden has attempted to make the collection as comprehensive as its budget would permit.

It is definitely, however, a collection of naturalized Narcissi and no variety is knowingly added to the collection which does not give promise of doing well under natural conditions. The stem must be stout and strong, the color must carry well at a distance, the blooms must wither quickly and as inconspicuously as possible, and above all the variety must have the vigor to compete with blue-grass sod and yet not to increase so rapidly that it requires frequent replanting. While it might be supposed that much of this information is already in the books we have found to our sorrow that it is not. There is the curious paradox that although of all bulbs Narcissi are the most satisfactory for naturalizing little or no *exact* information on the subject has been published. The collections at the Arboretum have been planned to supply that deficiency for the climatic region served by the Missouri Botanical Garden. By reading, by correspondence, by visiting other gardens, a group of promising varieties have been selected. Accurate records are made of the number of bulbs planted and so far as possible records are made each spring of the number of blooms obtained. Though this has been carried on for only five years and though it began in a very small way, valuable information has already been obtained. An elaboration of this method has suggested itself but has not yet been put into operation. If whenever an additional variety had been added to the collection the bulbs had been accurately divided into two equal portions and the halves had then been planted at different sites exact information as to site-preferences in this vicinity could very easily have been obtained.

One of the reasons exact information about the behavior of naturalized bulbs is so hard to obtain is the difficulty of keeping such a collection labelled. Several of our best varieties are unnamed because they came to us from other gardeners who had lost the labels or who had themselves received them in that condition. If one is growing narcissi in a grassy meadow it is next to impossible to label them in any ordinary way, since the labels interfere with the mowing and are easily lost and hard to locate. Mapping is fairly easy if there are only a few varieties but becomes difficult or impossible when a large number of varieties are grown. What appears to be a solution to this difficulty is to plant bulbs near permanent trees to which labels may be attached. In the meadow where the largest collection is located there are a number of volunteer red cedars which require only the aid of an occasional mowing to develop into specimen trees (mowing protects such cedars because it keeps out the broad-leaved trees which would otherwise shade and eventually

kill them). On the opposite slope from the cedars there are well-established specimens of various oriental crabapples. The cedars and crabapples are used as markers for the narcissi; each variety is planted near a tree, its label placed near the base of the tree where it is out of the way of the mowing machine, yet relatively easy to locate. This system seems to be working well at present but only time can tell if it will be permanently effective.

While it is too soon to make authoritative recommendations for this area, our preliminary results are suggestive, and should be helpful to others who are naturalizing bulbs on a fairly large scale. In general it appears to be true that smaller-flowered varieties have more strength to compete with the grass (though there are notable exceptions). It is also apparent that many of the best varieties for naturalizing are no longer common in the trade and must be searched for diligently. However, this is a blessing in disguise since it gives one the best of all possible excuses for visiting other daffodil collections. The varieties which we have had long enough to give a tentative recommendation are listed below in alphabetical order. Where the variety name, in spite of much effort, is still unknown, the listing is under our temporary nickname.

AEROLITE: This was tried out at Gray Summit because for some years it has had the longest blooming period of any yellow trumpet in the city garden. It has given a very good account of itself, coming through a late freeze in 1940 without any apparent injury and remaining erect through the almost continuous highwinds of the 1942 blooming season. Twenty-four bulbs planted in 1940 produced 48 flowers in 1941 and 57 in 1942.

BEERSHEBA: Our only objection to this variety is its price, which prevents our planting it in as large quantities as we should like. Six bulbs bought in 1938 gave us seven flowers in 1939, 9 in 1940, and 10 in 1941, though planted in heavy sod and given no special care. The flowers stay in bloom a very long time and are of such excellent texture that they can come through sleet storms without apparent injury. The disproportionately short stems are not a drawback in seasons with high winds.

BERYL: This variety was planted in semi-open woodland rather than in a blue-grass meadow and has done very well. It has increased from 4 flowers in 1939 to 22 in 1942. Those who see only a single flower of Beryl at a show may understand how the originator, Mr. P. D. Williams was about ready to throw away this charming little variety. Allowed to develop into a large clump it gives a better account of itself. The flowers open a greenish gold and slowly fade to white, so that a group of them shows a fascinating play of color.

BIFLORUS: This old-fashioned late-blooming variety does very well with us and has apparently never been winter-injured. In the region between Saint Louis and the Gulf Coast it is a common feature of many old gardens and has the ability to flower year after year with little attention.

EMPEROR: This has been one of the best varieties in our preliminary trials. Plantings of 50 bulbs each were made in two quite different situations in 1938 and all have shown steady increase of bloom year by year, whereas *King Alfred*, planted at the same time and in the same two locations, has shown fewer flowers year by year.

GLORY OF LISSE: Bulbs of this early-flowered Poet Narcissus were acquired locally and have behaved very well in our tests. It is useful because it flowers at the same time as many of the yellow varieties and gives variety in the landscape. The small flowers and rather crooked stems which make it a poor exhibition flower seem quite appropriate when it is naturalized in the grass.

LAURENS KOSTER: We have used this Poetaz in background plantings because it is fairly common in the lower Mississippi Valley and bulbs can be obtained very reasonably. While most of our plantings are only two years old they are apparently doing well.

LONG-STEMMED LEEDSII: We have not yet been able to identify this yellow mid-season variety which was given to us by Mr. John Howe of Pacific, Mo., for whom it has given excellent results when naturalized along an old fence row. The stems are tall but very stiff so that it comes through wind storms in good condition, even in exposed positions. The flowers are small but graceful in proportion to the stem and they are held so high that they give the impression of floating above the meadow.

OLD-FASHIONED YELLOW TRUMPET: This small, very early-flowering variety was obtained locally from an old garden and is one of the most satisfactory in our collection. It flowers only a few days after February Gold and has the same color in the perianth as in the tube so that its color carries well at a distance. It is hardy and vigorous and soon makes strong clumps when naturalized in the grass.

RECURVUS: We were fortunate enough to acquire a large stock of this splendid old variety from an old estate and it has done very well with us. While it prefers a cool spring it is one of the few poets which hold up well under hot dry winds from the southwest. We have put it in a variety of situations and it has done well in all of them.

SEAGULL: This variety was obtained from an old garden in the vicinity of Gray Summit. It was planted in semi-shade and has increased rapidly and makes a beautiful landscape display. If our preliminary results are significant it is better for naturalizing in this region than the very similar variety *White Lady*.

SIR WATKIN: This variety is very reliable under Missouri conditions. We have planted it in the city and the country, in full sun and in semi-shade, in poor soil with a poor turf and in rich soil with a heavy turf. In all these situations it has held its own with no pampering and has slowly but steadily increased year by year.

VON SION: This old-fashioned double yellow trumpet may not look attractive when it is grown in full sun and seen close at hand. Given a little shade it becomes a greenish yellow rather than a yellowish green and like many double flowers it stays in bloom for a very long time. Since it is cheap and easily obtained it makes a good background for choicer varieties.

We shall be very glad to hear from others as to their experiences in naturalizing Narcissi in this country, particularly in the middle west. We will be especially grateful for the names of varieties, either new or old, which should be added to the collection and for suggestions as to where they may be obtained.

THE DAFFODIL IN FLORIDA

MARY P. FINLAYSON, *Monticello, Florida*

*“That comes before the swallow dares and takes
the winds of March with beauty.”—Shakespeare.*

Are they a success in Florida?

If you could wander in my garden at blossom time and see “a crowd, a host of golden daffodils fluttering and dancing in the breeze” naturalized by the thousands in the grass beneath the spreading limbs of the old Live Oaks, you would no longer be a doubting Thomas. Wordsworth’s lines rush to the lips of many visitors when first beholding the prodigal blossom. There could be no better description of the picture.

A Northern visitor, once when my garden was open for some charity, having almost outstayed daylight, suddenly spied me, and exclaimed—“are you the mistress of all this beauty? I think these daffodils wandered up and down the country-side looking for a congenial home, and when they found this place, tucked themselves in, and have been smiling happily every Spring since.”

They are planted in great drifts or irregular flowing ribbons, each variety segregated. These large masses, so long established, are chiefly the old reliable sorts—*Sir Watkin*, *Emperor*, *Empress*, *Barrii Conspicuus*, *White Lady*, *Victoria*,—and form the backbone of the planting. Sizeable colonies of the newer kinds, too numerous to mention, have also been added. Especially effective are the new large white flowered Leedsi, white trumpets, and the spectacular red cupped or crowned ones. Newer ones are added yearly for interest. All ever tried perform well except *Croesus*, *Will Scarlet*, and that exquisite, fragrant *Alba Plena Odorata*. Too warm for the latter, and buds form on tall stems only to blast.

All doubles are failures. Most varieties, however, naturalize delightfully and indefinitely, except *King Alfred*, which requires replanting every four or five years to flower freely.

Almost my first large planting was a colony of *Sir Watkin*, in deeply prepared soil, well enriched. As in the old Virginia gardens, they continued to blossom and multiply for thirty-five years, with no other attention than a yearly sprinkling of bone meal. Their increase completely filled the grass spaces at the surface, and though they continued to be good doers, I thought they deserved more roomy living quarters. Dug the entire lot, and found they had not only touched noses at the surface, but had added their progeny below. They were dug in chunks of tight masses four or five bulbs deep. This increase, from an original few hundred bulbs, made a big start for my fields, as a garden of three acres would not hold the increase from various kinds.

Once, Dr. Hume brought Dr. Griffiths, of daffodil fame, to see the flowers which unhappily were almost past. He remarked "the success of daffodils in this climate is quite a surprise, but I am sure there is one variety—*Victoria*—that will not respond to coaxing." Promptly came the answer, "You guessed wrong—it flowers 100% regularly, long stemmed, large blossoms, great clumps of them." He was so surprised, he bluntly replied "I do not believe you." Dr. Hume courteously intervened, "Mrs. Finlayson is a truthful woman." I laughingly invited him to return next Spring in time to see them. Came his reply "I am tempted to say, I shall." My suggestion was that the soil, a natural deep humus and semi-shade provided conditions to their liking, as comparison with those grown in cultivated rows in open sunny fields showed short stems, smaller flowers and scant multiplication.

Last year, I had occasion and the courage to dig and separate these old clumps—not expecting them to flower the first year, but they did; and a visitor standing in front of them, asked "what lovely variety is this and so early?" She seemed surprised and said "My Victorias scarcely show a flower even after I moved them."

Perhaps, some growers in this section wait too late to dig daffodil bulbs, not before the Summer rains have induced new roots to form for next year's job, which will not of course repeat themselves, and the blossom sulks in the bulb and cannot show itself. Also digging too often does not produce vigorous and floriferous bulbs. They resent the yearly digging method necessary for the commercial success of the narcissi of the Paper White type. Every two or three years is quite often enough to dig commercially grown daffodils. All daffodils here are greatly increased in size by the method of cultivation in rows in fields, with the notable exception of *Victoria* and *Poeticus*. But while a whole field in flower is rather breath-taking, it is not nearly so lovely as naturalized masses in a setting of green grass and spring flowering trees and shrubs.

They love plenty of water when they are forming their flowers in the bulbs, and at blossom time—keep them growing as late as possible. They appreciate a cool mulch of leaves during our hot summers. We cannot produce the smooth, brown skin shiny bulbs, and ours are smaller, but with little attention, produce fine flowers in profusion.

The huge Western bulbs, as well as intensively grown cool climate Eastern ones, produce enormous flowers the first year, while the second season, blossoms are spare or often none at all. The third and fourth years bring flowers no larger than our acclimatized local ones, provided ours have had good treatment.

CRINODONNA HOWARDII

E. O. ORPET, *California*

There are few hybrid Amaryllids of American origin that are bi-generic in origin. One, produced by Fred Howard, has been recognised by the R. H. S. in London with a certificate and yet this plant is rarely seen in cultivation (See Fig. 85.). This is perhaps due to slow increase by division of the clumps. However, one may double the number each year.

The parents of this plant are *Callicore rosea*, seed parent, and *Crinum*, pollen parent. It is not stated which *Crinum* was used, but it is fair to assume that our most commonly seen, *Crinum Powellii* is the one. A similar hybrid had been produced by the reverse cross in Italy previously but it is not in cultivation in this country.

There are often twenty flowers to a stem, lasting at least a month in succession. The flowers are a beautiful pink color. The best feature of this hybrid is, that it is evergreen with beautiful foliage and also



Figure 85. *Crinodonna Howardii*; left, entire plant; right, close up of flower scape. Photo by E. O. Orpet, Santa Barbara, Calif.

each mature bulb will flower at least three times a year. It seems that it is only a matter of a “drink” after the flowers fade before another flower stem appears before the older one has dried off.

Mr. Fred Howard had a reputation for years past as a keen breeder of other garden plants, particularly roses. We have in mind however, that roses come, roses go, but his *Crinodonna Howardii* will outlive many of these, to commemorate his name.

HYBRID AMARYLLIS SYMPOSIUM

We are indebted to a number of Amaryllis enthusiasts for the following symposium, chiefly on hybrid Amaryllis. It is hoped that such a group of articles on hybrid Amaryllis can be included in each issue of HERBERTIA. Growers should take this as an invitation to send in contributions which should be received by July 1 if possible. —*Ed.*

BULLER'S HYBRID AMARYLLIS

WYNDHAM HAYWARD, *Florida*

For a number of years we have been in correspondence with Mr. A. C. Buller of Dwarsriviershoek, Stellenbosch, Cape Province, Union of South Africa, concerning *Amaryllis* and their breeding. Mr. Buller told us of his work covering a period of forty years or more in hybridizing choice types for the production of extra quality exhibition flowers.

Early in 1942 Mr. Buller sent to R. W. Wheeler, Treasurer of the American Amaryllis Society, a selection of Kodachrome color transparencies of a few of his best types of blooms, which said even more than Mr. Buller had professed as to the superb quality of his hybrids. A few of these kodachrome films have been printed in black and white, for reproduction in the current HERBERTIA, and all *Amaryllis* enthusiasts are referred to these pictures (Plates 237 & 238) for further enlightenment on what splendid work can be done with these bulbs in a far-off part of the world with years of conscientious application and selective care.

We pay tribute to Mr. Buller as a real plantsman, a talented hybridizer and a lover of the beautiful in *Amaryllis* flowers with the inspiration to carry through years of effort to achieve what seems to be near perfection in the quality of his flowers.

A FUTURE FOR AMARYLLIS

A. C. SPLINTER, *Florida*

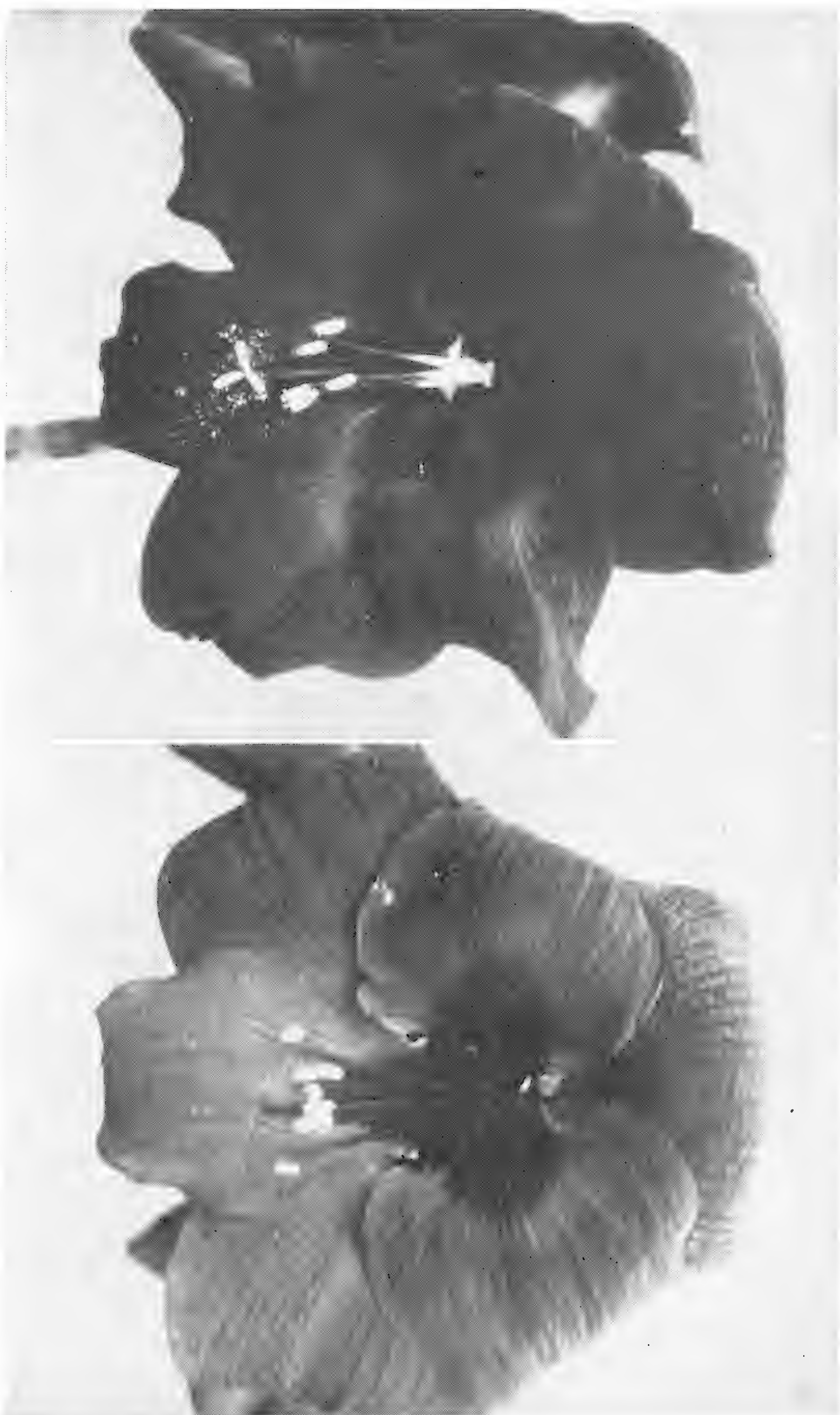
When we look at the present war we must assume, that regardless of how destructive it is and still is going to be, it will in the end undoubtedly open the door to another and greater era. Great changes have already taken place in many parts of the world including this country and more are yet to come, and they will affect most everything, our daily life, our schools and institutions, our industries, our agriculture and last but not least, the various branches of horticulture. However, these changes will not permanently retard anything in this country.

Especially two branches, the seed growers and even more so the bulb growers, will finally come into their own in the post war period, provided of course that they are not short-sighted and possess enough ability and energy to hold onto the rather enormous possibilities that are going to be offered. World War I did bring considerable changes and much could have been accomplished during the years that followed if the bulb growers had kept their eyes open and had taken advantage of

A. C. Buller, Union of South Africa

Plate 237

Buller Hybrid Amaryllis, left, No. 1, rich wine color; right, No. 2, rich, deep red-scarlet.





A. C. Buller, Union of South Africa

Buller Hybrid Amaryllis, right, No. 3, pastel cream with pink lavender blush; left, No. 4, light scarlet with white star.
Plate 238

the possibilities. But only a few were able to see the light, the majority went wailing along the old trail. World War II was required, and especially a war with Japan, to end (let us hope) the importation of cheap bulbs, the one high hurdle over which no home-grown bulbs were able to jump during all these many years.

The results should in this case be far reaching provided the bulb growers are at the end of the war sufficiently prepared to handle the situation. It will then for the first time become possible to establish a mighty industry entirely free from foreign competition, a competition which especially in the case of Japan, was for a long period of time so powerful that it could keep down any attempt to grow Easter Lily and other *Lilium* bulbs in the United States. Millions of dollars went out of this country for bulbs and a good many of these millions went to the Land of the Rising Sun, where they were certainly not used for peaceful purposes. That much and more we know now and let us hope we won't forget.

But let us also hope that the efforts to raise home-grown bulbs will not become one-sided and that all work is not going to be centered entirely on the raising of Easter Lily bulbs. That would be a great mistake as it would first give our enemy that welcome chance to switch over to all the types of bulbs which we would not grow and secondly would leave us still dependent upon other sources for such bulbs even if we would not buy them directly from Japan. Unfortunately, such one-sidedness has been characteristic of our efforts for a long time much to the detriment of types of bulbs which were grown in fairly large quantities in many parts of the United States in the past, and are still grown today but have for one reason or another never had the opportunity to dominate the market like the Easter Lily.

There is for instance, the hybrid *Amaryllis*, comprising many different types and an endless number of varieties of great beauty. The members of this class of bulbous plants including even the most modern hybrid types have never in all their history been given the chance they deserve but have for some unexplained reason been shunned by the greenhouse growers and even more so by the florists. The *amaryllis*, in spite of its long history has always been compelled to play a secondary role on the flower market and although there have been periods when it appeared that they were finally coming into their own, it never did really happen that they became a product annually demanded by the general public.

It is perhaps true that there have been at all times *amaryllis* fanciers and *amaryllis* enthusiasts who spent much time and money on this class of plants. Likewise there have been and still are today, large collections in existence in private and public gardens, but to the majority of the flower-growing establishments, *amaryllis* are still a class of plants not sufficiently appreciated. I have yet, after long years of traveling, to find an entire glass-house in a commercial undertaking reserved for the growing of *amaryllis* either as potplants or as cutflowers. And in cases where I really did find some there were never more than a few hundred at the most and then usually under conditions which were not at all suitable for the growing of perfect *amaryllis*.

Numerous reasons and excuses are offered as justification for the neglect of this beautiful bulbous plant. The major complaint made by the greenhouse growers is, that they can seldom if ever get a sufficient supply of a uniform type of bulbs. That is, even if the bulbs are uniform in size, they are not uniform in habit, color and size of flowers and what is worse a great many bulbs when forced under glass, will bring one or two flower-spikes but will not develop any foliage and on account of this are as a potplant unattractive to the average customer and even more so to the florist. He particularly has always claimed that an amaryllis is a difficult plant to sell, either as potplant or as cutflower. As potplant it requires too much "make-up" in order to appeal to the customer, and as cutflower it is too stiff, and in the case of the modern hybrids, the flowers are too large and heavy to fit to advantage into customary arrangements. Aside of that he claims that amaryllis flowers are a poor item for shipping.

However, even if granted that an amaryllis as a potplant needs a make-up, what other flowers do not need to be dressed up before they appeal to the customer? The florist who can prepare an Easter or Regal Lily for selling as a potplant, has certainly not a bit more trouble with an amaryllis, more likely he has less. And as far as the use of amaryllis in flower arrangements is concerned it can be said that new ideas usually have their foundation in the imagination of man and nowhere else and a florist is supposed to have imagination if nothing else. Shipping of amaryllis flowers is probably somewhat more difficult than shipping of chrysanthemums but it is certainly not as much as shipping orchid flowers, besides it has been demonstrated in the past that amaryllis flowers can be shipped over great distances and still arrive in perfect condition.

All in all it can safely be assumed that if the florist will finally discard his ungrounded prejudice towards amaryllis and will give this flower a more serious trial, he may yet come to the conclusion that it is a very worthwhile item especially if he realizes that his beloved "Jap-lilies" will never come back again. The greenhouse grower also can, if he is willing to make some efforts in that direction, help a great deal to make the amaryllis a popular flower in the future. His troubles and failures mentioned before are only superficial and can easily be eliminated as they have their foundation firstly in the buying of the cheap bulbs of certain strains and secondly in not providing the right growing conditions, etc.

The quality of all of these older strains of amaryllis was probably much better 40 years ago than what it is today. This is exclusively the fault of the bulb-growers who by failing continuously over a period of many years to obey the laws of hybridization and by failing even more, to select only the very best material for breeding and marketing, have brought their bulbs down to a very low level. On account of this they must, in order to stay in business, sell their bulbs at often extremely low prices leaving little or no profit. However, such growers deserve no sympathy because, aside of being a menace to themselves, they have by selling their worthless bulbs spoiled continuously the chances for

the amaryllis to become a popular flower in the market. Such growers must finally be taught by their own failure and misfortune that growing of amaryllis bulbs must, like roses, carnations, etc., constantly be kept on a high and modern level.

The old idea, to raise from a thousand seed a thousand bulbs and then regardless of quality, etc., sell these thousand bulbs at any price, must finally be eliminated. If not by common sense then by suffering the consequences which all bad business has in store for those who will not listen. There is absolutely no need to keep on growing those old and outworn strains as new and really magnificent strains of various types of amaryllis are, and in fact have been in existence for a number of years in this country and over-seas in England and the Netherlands. All that is needed now is to grow such modern types in great quantity. It is almost certain that once such new and modern amaryllis begin to dominate the markets and the flower-stores, a strong public demand will develop, especially if competent writers and growers, etc., will continue to disseminate in garden magazines and other publications advice on how to grow these bulbs successfully the year around.

In general the people all over this country, and particularly the members of the many garden clubs, have in the past, at flower-shows and special amaryllis shows, professed deep interest in this showy class of flowering bulbs and have always been eager to gather information in regard to culture, care, etc. However in my opinion, it is the average florist and greenhouse grower who above all others, can within a very short time bring about the greatest change by offering the public on all occasions from early winter till late spring, these new types of amaryllis not only as a substitute for but as something better in place of that which he could offer before. For instance, brilliant red amaryllis will undoubtedly sell at Christmas time, pure white would be perfect for Easter and for the many pink and other shades there are many occasions on hand between Christmas and Easter on which they could be used to the best advantage.

Since vegetative propagation has become a reality it is possible, in fact it has been so for several years, to multiply any desired shade or color in great quantity and in less time than was formerly needed when all bulbs were raised from seed or off-shoots. This method, practised first in Holland and now also in the United States, will undoubtedly within a few more years become a great blessing to the growers of amaryllis bulbs as it eliminates all the uncertainties which must be expected when the bulbs are grown from seed. Vegetative propagation gives absolute guarantee in regard to color of the flowers, vigor of the bulbs, habits and time of flowering and numerous other factors which after all are of great importance to the florist and greenhouse grower. Both it must be admitted cannot gamble with their crops but must have a product worth their time and efforts to make it salable and amaryllis growing has until very recently been undoubtedly a gamble. Therefore it is absolutely necessary for the modern bulb grower to become familiar with vegetative propagation. It will solve many old problems and is in fact the only solution fit to make amaryllis growing

in the future profitable to all who are either engaged in growing bulbs or in selling potplants and flowers. It is moreover the only chance to gain for this bulbous flower the recognition which it so rightfully deserves.

Thus in conclusion I say again, let us make use of our ability to plan and to contemplate in order to be well prepared and ready for the great possibilities after this war has been won.

HYBRID AMARYLLIS CULTURE NEAR MIAMI, FLORIDA

J. G. DUPUIS, M. D., *Florida*

This project is located in Southeastern Florida at Miami, 367 miles south of Jacksonville. My Lily Garden is approximately 4½ miles west of the Atlantic Ocean on the edge of the Everglades.

The climate in this area prior to Everglades drainage was nearly semi-tropical, however, since the Everglades drainage, the surface water has been depleted from this area known as the Everglades Drainage District covering practically eleven counties in Southern Florida. The wonderful semi-tropical climate we enjoyed in this territory, prior to drainage of this vast area of reserve water, has changed greatly. Notwithstanding the climatic changes, we still have and enjoy a climate to which many thousands of people come annually to enjoy the even temperatures in the "Land of Sunshine and Palms."

The plot of soil in my garden in which I have been growing Hybrid Amaryllis since 1935 is of a grayish sandy loam with a rock foundation, and of an alkaline character.

My first purchase of foundation stock was Mead Hybrid Amaryllis, the same being purchased from a grower near Orlando, Florida. His entire output was purchased and consisted of very small to medium size blooming bulbs, about 3500 altogether.

Beds were about seven feet across and elevated to about 3½ to 4 inches. On top of this bed we planted the bulbs in rows about 18" apart, and in the drill according to size of the bulbs 15" for the large ones and 6" apart for the smaller ones.

About a year later I had the privilege of selecting additional bulbs in person from a grower in Jacksonville, Florida, in the month of April, when the lilies were in bloom. I had the advantage of selecting individual bulbs of my choice as to color pattern of the flowers.

The bulbs were planted in like manner as the first. All of them grew rapidly and the first spring, the larger bulbs bloomed and there were many very pretty individual and rare patterns of flowers.

Having read somewhere an article that practically all Lily bulbs should be removed from the ground and given a resting period, I had all of my Amaryllis bulbs pulled up in the fall of the second year and put in the shade for a rest period. However, after about two months, the bulbs were shrinking rapidly and something had to be done quickly to preserve my foundation stock before they dried out. Therefore, the bulbs were promptly replanted and have not been removed for any subsequent rest periods for my observation is that Hybrid Amaryllis in

open field planting need no rest period as they grow practically the entire 12 months of the year in southeastern Florida. The rest period for my bulbs was a great shock to them and it took one or two years for the bulbs to overcome the setback they had received.

Hybrid Amaryllis require frequent applications of both chemical and organic fertilizers, also a broadcasting of well rotted stable fertilizer in the fall is a good practice. They need but little cultivation. To keep the grass and weeds removed is enough.

Now as to some of the pests, since every garden has some disadvantages. The plot of soil in which my Amaryllis were planted was and is now infested with nut grass, this implies naturally a hand picking job. However, this method has an advantage, while the nut grass is being hand picked, the same workers can kill the grasshoppers, also a black striped worm colored similar to a Zebra that comes in the spring of the year. If these three items, which are classed as pests, are not subdued vigorously in the spring months, the Hybrid Amaryllis will suffer both in growth and production of beautiful blooms. The grasshoppers and worms have robust appetites for both foliage and flowers.

There is one other pest that can be controlled by spray solution. If one plants Gladiolus nearby late in the spring, the thrip, which is bound to come as soon as the days grow hot early in spring, will infest the Amaryllis blooms and destroy their beauty. It is best not to plant Gladiolus near the Amaryllis that will bloom in the hot days of spring-time.

Nut grass remains dormant throughout most of the winter season and a plan has been worked out to control its growth and save the expense of hand picking during the summer months by planting a field pea which was originated in the Bahama Islands. It is a good vine, with free foliage and it makes a prolific covering that keeps the nut grass dormant throughout the hot summer months. This variety of pea has the capacity of fixing nitrogen from the air by means of root nodules. The shading of the soil is also an advantage in this section in the summer.

Two years ago, we separated many blooming size bulbs from each original bulb, from three to six bulbs, which were transplanted in rows as stated above, making a total of about 10,000 or more blooming size bulbs. Two years ago also I planted seeds and after the seedlings were three to four months old they were transplanted to the open field. A few of them bloomed this past spring at the age of 24 months.

Last spring I planted many thousands of seeds in June and practically all of them germinated. The seedlings were transplanted to open field and now the young plants and adult plants represent a total of many thousands of bulbs. The best results were secured in planting seeds in boxes of good mellow soil, with some humus, well drained. The seed were planted about one-eighth inch under the soil, tamped firmly, and covered with one thickness of burlap sack and kept moist by frequent sprinkling. As soon as the little plants come through the soil, the sack was removed and watering was continued at frequent intervals. Partial shade is good for the seedlings and transplanting to field should be done in October or November.

My bulbs have the advantage of overhead sprinkler irrigation and when the soil gets dry, we turn on the water in the evenings as the Amaryllis require plenty of moisture and fertilizer to do their best.

In the spring of the year, early in March and through April, May and June, the gorgeous blooms of Hybrid Amaryllis will gladden the heart of those fortunate enough to have them for companions. Arrayed in color, tint and patterns with their glorious smiles of indescribable beauty, and presenting a panorama by the tens of thousands of blooms, welcoming with a charm and smile of the beauties of nature, this is truly comradeship—really worth while and an inspiration to life itself.

The past year we have found very appreciative customers for many of our mature bulbs and have introduced the flowers, which cover several months in the Spring, to the cut flower trade. To our surprise they were joyously received by the public as the cut flowers remain fresh and beautiful from four to seven days when given usual care.

From my experience in growing Hybrid Amaryllis I have learned a little and enjoyed the work more than words express. When these beautiful flowers are in full bloom in the spring months a few moments' visit amongst them in the early morning has the tendency to start the day on a more cheerful note, especially to a Physician and Surgeon, since a great deal of his routine patronage and consultations are made up of pains and complaints.

My best reward for all the work and effort given to this project is to present these beautiful blooms to friends. To my mind a bouquet of these beautiful lilies conveys a message which is impossible to express in words.

To any one who may chance to read this article, I hereby extend a welcome invitation to visit my Garden when in full bloom to enjoy a picture of nature in color,—a panorama of myriads of beautiful Hybrid Amaryllis.

AMARYLLIDS IN SOUTHERN CALIFORNIA

F. L. BENNETTS, *California*

Observation of amaryllis growing in Southern California is a revealing experience, especially to an amateur. From growing a few bulbs in yard and pot, to go and see literally acres, planted to hundreds of thousands of bulbs, really gives one something to talk about. The two most extensive amaryllis plantings here are probably those of Rice Bulb Gardens of Downey, 500,000 bulbs; and Howard and Smith Inc. of Montebello, 200,000 bulbs. To see these same acres in mass bloom, during early spring, is to see amaryllis paradise unveiled. One certain conclusion reached by any observer would be that this bulb has certainly found a real home in the climate and soil of this section of the country.

Conversation and correspondence with the larger growers indicate that nearly all bulbs are in field plantings. Here the amaryllis is so hardy that even the seedlings are grown in the open and then transplanted to the fields from which they are ultimately dug for market.

These field plantings are usually in long rows, thirty inches apart and with six inches between bulbs. Power tools keep the soil in condition, and flooding or sprinkling supply moisture. Some form of irrigation is always necessary, because the growing season is the dry season in Southern California. Fertilizer is regularly applied, usually in organic form. From these large field plantings, selections are made for propagation; the general run is eventually sorted by color and sold in wholesale lots; white, reds, scarlet, orange, rose, fancy striped, etc. One grower, and perhaps others, follow the system of replanting bulbs by color classification as soon as they have bloomed.

Hybridizing is carried on quite extensively. Howard and Smith probably has the largest number of bulbs used exclusively for this purpose, between four and five thousand. These are kept in pots and flowered under glass. Records of crosses are kept, and the whole business followed through most systematically. It is a rare treat to walk between the long rows of benches at flowering time and see the great variety of size, shape and color represented in these selected bulbs. Under the controlled conditions possible with glass and heat, flowers attain a high degree of perfection. Blooming period in these houses is a perpetual amaryllis show. Other growers hybridize from segregated field plantings. Mr. Rice has a very large plot of selected bulbs which in blooming season is a marvel of color and perfection, successfully contending with the elements of sun and wind. He also has some plots in which he is growing and propagating named varieties. It is impressive to see scores of flowers, uniform in shape and color, massed in a single planting.

There seems to be little tendency to grow named varieties. Cecil Houdyshel lists several strains of amaryllis, and the following named varieties: *Lady Helen* (Capsicum red, self colored), *Sibyl Houdyshel* (pure white with narrow pink line on border flushed and lined pink in throat, fragrant), *McCann's Double* (twenty or more petals, shades of red). Among the collection in the Rice Gardens are the following: *Java* (purple, white throat), *Lady Helen*, and *W. N. Campbell* (very large white with vivid scarlet blotches). The writer has a small collection, several hundred young bulbs representing a number of strains. Two of the most valued named varieties in this collection are *McCann's Double*, and *Ruby Supreme*.

One of the most interesting and complete collections of amaryllids in this section, if not in the country, is that of Cecil Houdyshel. On the outskirts of the picturesque little town of La Verne, Mr. Houdyshel has ten acres under cultivation. More than forty years of experience guides the management of that wonder farm, in which hundreds of thousands of bulbs of all kinds are at home.

The entire planting is irrigated by overhead sprinkling systems, all of which are controlled by centrally located valves. Cultivation is done with a small tractor, a wheel hoe and other hand tools. An onion planter is used for some bulbs and a seed planter, hand operated, for planting small seeds. Fertilizer is applied with a Planet Junior. Mr. Houdyshel says that he digs bulbs the hard way, "by the gopher method" (at this point in the discussion he put in an urgent plea for the invention of a real bulb digger).



A. B. Lytel, Santa Barbara, Calif.
Blue Amaryllis, A. procera in California

The estimated number of bulbs growing on this unique farm is several million, representing at least 1000 varieties. Among the many families represented, there are approximately 500,000 bulbs in the Amaryllis Family alone. Of amaryllid species and hybrids there are about 500. This would not include variations in mixed lots, but would include varieties under observation but not yet introduced. In his planting there are 20,000 hybrid amaryllis, no two of which are just alike.

In the total collection there are many rare sorts or species of bulbs, too many to list. As an example, in one genus, *Haemanthus*; there are these: *coccineus*, *albiflorus*, *puniceus*, *katherinae*, and *carneus*. Of the latter species, Lt. Colonel Grey says in his "Hardy Bulbs," "I doubt if anyone has this now."

Mr. Houdyshel has given many years to hybridization. Hybridizing crinums is his specialty and of his best known originations these are outstanding: *Cecil Houdyshel*, *Virginia Lee* and *Gordon Wayne*. He is also hybridizing *Callicore rosea*, *Amaryllis*, *Haemanthus*, daylilies and others.

In the estimation of the writer, one of the outstanding services, to the bulb growing enterprise, is the unique catalog published by Mr. Houdyshel. This listing groups bulbs according to families to which they belong, which is a decided improvement on the usual alphabetical arrangement. The descriptive material is excellent. Cultural notes are numerous and specific, written by one who has spent most of a life time growing the bulbs about which he writes. In spite of the fact that many families of bulbs are offered, there is to be found here one of the most complete listings of amaryllids in this country.

In collecting notes for this contribution to HERBERTIA, the writer has been much impressed by this fact: quantity production has not destroyed the quality of enthusiasm that these large growers have for the bulbs. Years of growing and extensive plantings have not dulled the ardor of their first love. Their willingness to share experience and enthusiasm with an amateur has been much appreciated, and has made possible whatever information and interest this article may convey.

THE BLUE AMARYLLIS IN CALIFORNIA

A. B. LYTEL, *California*

In August, 1939, Las Positas Nursery received from Brazil bulbs of this beautiful Amaryllid (*Amaryllis Procera*). They were planted in a bed raised about five inches from the ground, made of decomposed granite shale, with full exposure, getting all the morning sun and part shade in the afternoon. One bulb flowered for the first time this year,—the first bud appeared fully developed about the twelfth of August, and opened wide about two days later (See Plate 239.). There are four wide-open flowers still in good condition after five days, and new buds are appearing on other bulbs. In all there are nineteen fully grown bulbs and we have fourteen offsets showing good growth.

The flowers measure 6 inches in length with a diameter of five inches, their color is a violet blue, with ruffled pointed petals, and a

white throat, self-spotted rather far back from the edges of the petals in the fashion of some Gloxinias. The stems are twelve inches long from bulb to flower, with leaves averaging sixteen inches in length, and some one and a half inches wide. The flowers are far more beautiful than any we have seen pictured,—probably because they have gone through their full growth cycles in their present surroundings instead of being latent in immature bulbs which had a long journey between collecting and flowering.

SPREKELIA IN SOUTHERN CALIFORNIA

THOMAS W. WHITAKER,
La Jolla, California

This beautiful crimson amaryllid from Mexico, commonly known as the Orchid Amaryllid or Jacobean-Lily deserves to be more widely planted in Southern California gardens, especially in the coastal area from Los Angeles southward. This area is practically frost free and seems to offer an ideal environment for *Sprekelia*.

Sprekelia thrives in the lighter soil types which are well drained, and the plants respond readily to light fertilization. Plants of this species are very vigorous, and multiply rapidly by the production of small bulblets at the base of the mother bulb. These can be taken up and separated at almost any time of the year.

The foliage is evergreen, and the dark-green, strap-shaped leaves may reach a length of two feet or more. Except for a period in the late Fall the plants are in bloom almost continuously. To convey some idea of the size of the flowers, I am recording a few measurements; in each case the figures represent an average of ten flowers measured,—*Scape*—10 to 12 inches long from the base to apex of the ovary. *Spread of flower*—7 inches in diameter. *Length of 2-parted spathe*—2½ inches from the base of the ovary to the tip.

Sprekelia will add a bright, colorful, and interesting spot to any garden. In addition, the blooms are excellent as cut flowers (See Fig. 86.). The long scape makes some attractive arrangements possible, and they deteriorate very slowly.

THE DEPENDABLE ALLIUMS

BERNARD HARKNESS, *Wisconsin*

Grow alliums and see the world can be used for a gardener's slogan. Africa and Australia alone are absent; Asia, Europe, North America are well represented and South America sends cousins, the genus *Northoscordum*. One may have in their garden *Allium giganteum* from the Oasis of Merv in Turkestan, *Allium atropurpureum* from Hungary eastwards to Persia, *Allium cyaneum* from the banks of the Te-Tung in Kansu, China, and thus take in spirit a safe and sane journey right at home to many of the most alluring names on the map of the world.

I began my allium journeys in the summer of 1932 when I collected seed of two alliums in the garden of Mrs. Fannie Heath at Grand Forks, North Dakota. Mrs. Heath, until her death in 1931, was prominent in introducing the prairie plants to gardens. One from her garden was *Allium stellatum* which, every year I have had it, has come into flower by September fifteenth in my garden where it has added a welcome bit of rose-pink brightness (Plate 240). Furthermore, it is a plant that stays with one the whole season through and its flattened light green



Fig. 86. *Sprekelia formosissima* as a cut flower. Photo by Dr. Thomas W. Whitaker, La Jolla, Calif.

leaves make graceful fountains of foliage some fifteen inches high. The other was *A. sibiricum*, a cosmopolitan species ranging from Maine to Alaska and through boreal Asia and Europe. From this I now have rosy-lavender and light pink flowering forms. They make generous clumps with abundant bloom in late May. Its foliage is round and succulent like chives to which it is closely related.

My next allium came by seed from Europe, its home. *Allium pulchellum* of all this huge genus that I have seen, is the one I should choose to call "the beautiful." It sends out a sprangle of cool lavender-lilac



Bernard Harkness, Baraboo, Wisc.

Allium stellatum

flowers in an umbel, flower stems of various-lengths, in July. Indeed, July is the month of bloom for several of the showiest of the alliums. *Allium flavum* is closely related to *A. pulchellum* but bursts its brassy yellow flowers from a prominent sheath on eighteen inch stems. I like very much a dwarf form known as *A. flavum minor* which grows only to six or eight inches and seems to increase in clumps more readily. The flowers of this yellow allium are sweetly fragrant, although odor is a subject an allium enthusiast seldom dwells upon. Another European species that I have had under the name of *Allium bulgaricum* is, I believe, properly *Allium rotundum*. It has a globose head of flowers like a small teasel of a deep wine-red on two foot, round stems with smallish leaves. It has been much admired in the garden.

I admit to being partial toward alliums but where, I ask, can such an interesting variety be found within a genus of easy culture and hardy in Northern gardens. There are alpenes from the Western mountains including one named for Pike's Peak that blossoms early in May. There are equally dainty species from Asia that hang out little blue bells late in summer from grassy tufts of leaves. There is the bold, broad-leaved species from Turkestan, *Allium karataviense*, with large round heads of flowers. There is the beautiful June-flowering *Allium caeruleum*. Its flowers are sky-blue and there is an ample round ball of them on tall stems for all to see. For some time a plant has been distributed in this country as *Allium tibeticum*, but the botanists have stoutly maintained that the name belonged to a grassy blue flowered Asian species whereas no name seemed available for this excellent foot high plant flowering in June, reddish-purple on slightly winged stems. Recently it has been named *Allium Farreri* in honor of the well known plant explorer, Reginald Farrer. There is *Allium cernuum* that ranges widely over North America in many forms. One of the best I have seen came to me from a mountain range in New Mexico. Its flowers are a delicate pale pink of waxy texture; a twist in the flower stem makes the flowers nod, a characteristic of *A. cernuum*. This New Mexican form flowers in August.

In cultivation in our gardens alliums seem unusually tractable. In my small garden in central New York I grew the western alpine sorts in a lean gravelly soil, the others in a perennial border of rather heavy clay loam enriched with barnyard manure. I have given *Allium validum* a partially shaded spot on the north side of a shed where moisture is retained longer but that seems a small concession for a plant of wet mountain meadows of northern California and Oregon. There back of a group of Christmas roses its lush foliage and rosy-pink flowers in August are very pleasing.

In most allium collections there is an abundance of medium tall, twelve to fifteen inches high, early summer flowering, fleshy-stemmed varieties of dull pink or lilac flowers. One of the showiest of these I have tentatively labelled "*Allium angulosum*" from its twisted flower stem. It came in a seed packet as *Allium ammeophilum*. These are the hardest to distinguish botanically and possibly have the least interest for the gardener.

When Regel published from the St. Petersburg, now Leningrad, Russia, Botanic Gardens in 1875 his monograph of the genus, he described 256 species. Since then many Asian and North American species have been added. Readers of Louise Beebe Wilder's, *Adventures With Hardy Bulbs*, know that she grew and enjoyed many species of allium in her garden. Lately we have had from England in Vol. 3 of Charles Henry Grey's, *Hardy Bulbs*, a splendid critical study of over one hundred species. My gardening experience has encompassed not more than fifty species hence I am looking forward to many more years of collecting alliums.

ZEPHYRANTHES INSULARUM

MARGARET WALMSLEY, *Florida*

The gardener, who remains in Florida during the summer season, knows the delights of many fine plants, denied to those acquainted only with the winter bloom. To my mind the honors are about divided between the large and small of it—Crinums and Zephyranthes. The latter are known as Wind, Rain or Fairy Lilies—now classed in various genera, including the Texas Rain Lilies—*Cooperia*. The long months of the warm season are truly enriched by the recurring masses of color of the many species of these garden jewels.

Everyone knows the giant of the group, *Zephyranthes grandiflora*, which comes again and again with its cheerful, rosy majenta flowers, from early April until cold weather puts it to sleep. A close companion is a delightful small white flowered Rain Lily, beginning in April and flowering with the greatest profusion, even without rain to spur it on, flowering on into the fall. This species is one of the real treasures of the group, for it fills a need supplied by no other. For as long as I have had a garden in Florida, which was begun in 1927, I have had this white Rain Lily. I cannot be sure whence it came to me, originally, although it seems that it was sent to me by my Mother from Southern Indiana, where she had obtained it from Dreers possibly as *Z. alba*. But it might have come with a few plants from Key West, when I was given the lovely *Key West Hybrid Amaryllis* (which I saw years later in one of Dr. Hume's illustrated bulb talks). All these years I have found this *Zephyranthes* the most profuse grower, seeder, and producer of bulblets. It seeds all over the borders, often coming up in the lawn, where it blooms, regardless of the lawn-mower. I have kept a group of it in a wire basket with a *Campyloneuron* and *Phlebodium aureum*, where it grows, blooms and multiplies as though it were an epiphyte, too.

One of my friends, a devoted bulb grower, has many of them making masses of white. We compared notes repeatedly. We wrote to Mr. Wyndham Hayward and others. Mrs. B. V. Collany sent some bulbs in flower to Dr. Hume, while I was impatiently waiting for another flowering. Dr. Hume identified it as *Zephyranthes insularum*, about which he wrote an excellent article in 1939 HERBERTIA. It is a real satisfaction to finally have a permanent name for the little waif.



Perry Coppens, New Jersey

South African Amaryllids—*Haemanthus*, *albiflos*, upper left; *Anoiganthus* *breviflorus*, upper right; *Cybistetes* *longifolia*, lower left; *Haemanthus* *puniceus*, lower right.

We bulb lovers get a real delight and help from HERBERTIA and feel grateful for that labor of love, so well done and so much needed. In our Garden Club, here, Dr. Hume has given us several illustrated talks on bulbs (and other subjects in other years). This stimulus has introduced many to the delights of bulb growing.

SOUTH AFRICAN AMARYLLIDS

PERRY COPPENS, *New Jersey*

In the summer of 1939 I received a shipment of bulbs from South Africa which included *Cybistetes longifolia*, *Ammocharis coccinea*, and *A. cornaica*. I was particularly interested in the *Cybistetes*. No flowers were secured during the first two seasons, but in August 1941, *Cybistetes longifolia* flowered. The plant was taken indoors while in bud. The scape was about six inches high and there were about eighteen flowers to the umbel. The flowers opened white, but after about the third day, they turned to a beautiful rose color and were very fragrant. (Plate 241)

I secured seeds of *Anoiganthus breviflorus* from South Africa and after three years of careful attention four fine bulbs were raised which flowered for the first time last year (Plate 241). This is apparently closely related to *Cyrtanthus*. The mature bulbs are about one to one and a fourth inches in diameter, the leaves are heavier than those of *Cyrtanthus* I have seen. The flowers appear with the leaves and are a beautiful golden yellow, 1 inch wide and quite open. This fine subject is well worth the trouble of raising it. I sent one of the bulbs to a Society member in California and have wondered how it made out. Last year the plants did not set seeds but I hope to secure some this season.

The Blood Lilies or *Haemanthus* have become more popular in recent years. Of the half dozen now for sale in this country, I think *H. multiflorus* and *H. Katherinae* are the best. The color of the flowers of the various species varies from brick red to red and scarlet. The umbels of *H. multiflorus* form a perfect ball, those of *H. Katherinae* are less spherical, and most of the others are of the paint brush type. Some, like *H. coccineus* (Plate 241) and *H. natalense*, flower before the leaves appear; others, like *H. Katherinae*, with the leaves. *Haemanthus albiflos* (Plate 241) as the name indicates, is pure white. It is an interesting curiosity. To flower well, *Haemanthus* need a pronounced rest period. A good soil with decayed manure and a little grit suits them perfectly.

EVERGREEN HEMEROCALLIS IN CENTRAL IOWA

FLEETA BROWNELL WOODROFFE, *Garden Editor*
The Des Moines Register And Tribune
Des Moines, Iowa

These notes are for northern gardeners eager to grow the newer evergreen and semi-evergreen hemerocallis varieties of which such tantalizing reports are coming from Florida and other southern points.

They are based on experience over the last 20 years with a good collection of hemerocallis in our admittedly difficult climate where temperatures both soar and dive alarmingly. Here part of our difficulties are due to the uncertainty as to whether we'll have rains in the fall—early or late. Plentiful late rains after a long dry spell in late summer too often cause even supposedly deciduous varieties to start into growth only to be caught by a sudden severe freeze. Some years, even *H. fulva Europa* has behaved with us like a semi-evergreen variety.

But, by now we've developed a system which brings such touchy but indispensable early mid-season kinds as *Queen of May*, the so-called *Queen Mary*, *H. aurantiaca major* and *Sir Michael Foster* through without loss of a single fan.

The fall care goes like this: (1) We cover early—after frost but before hard freezes are expected, with bur oak leaves or slough hay, using enough to fill in among the hemerocallis foliage and take it about out of sight.

(2) Then over this go 3 or 4 open sheets of newspaper.

(3) A basket or square of burlap is laid on top to keep the paper in place and for the good-looks of the garden.

In the spring about the time they start into growth we cut straight across each fan of hemerocallis leaves one to two inches above the soil. This cutting is most important because these stubs of leaves separate as the cut ends dry, and the tops, injured by winter temperatures ranging down to 20 and more degrees below zero, do not stick together.

Before we started shearing them early, they did stick badly. And in spite of repeated strippings of the watery frozen foliage, the tops of the still-green stumps of leaves pasted down on themselves as they dried. Often the new foliage and flower stems, too, were badly distorted as they pushed up against these tightly sealed caps, and were quite spoiled in looks for the entire season.

Other summer varieties not completely deciduous with us here, such as *E. A. Bowles*, *Iris Perry*, *Glorianna*, *Star of Gold* and *Golden West*, to mention some of the better known varieties, thrive under the same care—early covering that keeps the tops dry over winter, and clipping short in the spring.

The past two seasons in particular have given this plan of protection a thorough tryout. When we uncovered in the spring of 1940 after an "easy" winter most of these plants showed a good 8 inches of strong green growth. That fall with no frost earlier to slow up growth, they were badly hit, before they were covered, by the Armistice Day storm when the temperature tobogganed to zero with no snow. We did, though, cover as usual after the storm.

And all of these plants with their terribly frozen and watery tops were sheared off close to the soil in the spring of 1941, and they came on without distortion of their foliage to give us very satisfactory bloom.

Newspapers serve admirably for this sort of winter covering at no cost, and do not tear, when protected by basket or burlap, any easier than tough and expensive wrapping paper. From now on, we'll probably be using more of them because we can send them off to the waste-paper baler for use in the Victory Campaign just as well in the spring after they've done their bit in the garden.

DAYLILY WINTER FOLIAGE CHARACTER IN NORTHERN FLORIDA

JOHN V. WATKINS,
Assistant Professor, Horticulture, University of Florida

In HERBERTIA, volume 7, an article by this writer presented a rather extensive list which designated those clones which are evergreen, those which are deciduous in northern Florida. It is generally agreed that the evergreen character is of great value in the Peninsular State where winter gardening is the rule. Most of us who are interested in breeding *Hemerocallis* for the Lower South have this evergreen character continually in mind. When two clones are nearly comparable for garden purposes, the one which produces new leaves without interruption is to be preferred over the one which loses its leaves in the autumn and does not get new ones for a period of perhaps, five months.

In late January 1942 the plants were carefully scored for foliage effect and the results are recorded on the next page. The winter of 1941-42 was quite typical for Gainesville as temperatures in the middle twenties were recorded several times.

Of the 27 clones listed in the accompanying table, it is seen that 14 are designated as "F". These Daylilies are fully evergreen and have excellent mounds of bright green foliage which are of great merit in our winter gardens. The 13 varieties classed as "S" are completely deciduous, and produce no garden effect during the winter months.

The following list includes clones that have been under observation since the publication of the original article.

Table 1

Further observations on foliage behavior of daylilies
 in Gainesville, Florida

S Afterglow*	F Marcelle	F Star of Gold
S Amulet*	F Marconi	S Sunkist*
F Baronet	S Marcus*	F Swan
F B. H. Farr	S Moonstone*	F Sybil
S Bicolor*	F Osceola 2	F Taruga
S Charmaine*	S Persian Princess*	S Theron
S Dominion*	S Port*	F William Pelham
S Highland Chieftan*	F Red Bird	F Wolof
F Majestic	F Senator Andrews	S Zara*

Symbols used in the table "F"—full garden value throughout the winter in peninsular Florida; "S"—very short buds that stand perhaps "1" above the earth; no garden value; and (*)—completely deciduous, no garden value during the winter.

7. HARVESTING, STORAGE AND FORCING

HARVESTING, STORAGE AND FORCING OF ALSTROEMERIDS

HARRY L. STINSON, *Washington*

The actual harvesting or digging of the "tubers" will be greatly facilitated if special attention is given to the preparation of the beds some months before the "tubers" or seeds are to be planted in them so that later the actual work of digging will not harm the "tubers" and will be easy for the digger. Due to the fact that the "tubers" ramify far into the ground and are quite brittle when turgid, it is almost im-



Fig. 87. Digging *Alstroemeria chilensis* plants—very small seedlings are allowed to grow one season and are then dug for the trade; trench, top and bottom shown by broken line, is about knee deep in order to get under them. Photo by Harry L. Stinson, Seattle, Washington.

possible to extract them from the ground without severe damage unless the soil is positively free from grass sods, other roots, clods and other foreign obstructions. The beds should be located in a situation where they will receive ample moisture and yet be well drained from excessive rains, in full sun or if in the warmer parts of the country they should receive enough shade to prevent them becoming dry and hot. Experience has shown that the alstroemerias prefer a soil which remains cool and moist. The soil should be well worked to a depth of eighteen (18) to twenty-four (24) inches and made exceedingly friable and mellow by

the addition of peat moss, leaf mold, or well decomposed barnyard fertilizer. Let me emphasize again that the soil must be so friable that it will not pack firmly about the "tubers" but will crumble away easily with the least effort and allow the "tubers" to be withdrawn without damage (Fig. 87).

For my part I much prefer to plant the smallest sized seedling "tubers" sometime late in September or early October. The reason for the "smaller" tubers is that they seem to start growth quicker and make a more convenient sized "tuber" to market. The larger size "tubers" require more care and time to dig and the difference in market value does not seem to justify the extra labor involved, and the flowers are not greatly superior. The smaller sized "tubers" will make a cluster of three to four "tubers," each about three to five inches in length, a size very satisfactory to dig, handle, and market, and give equally good results to the purchaser.

The digging of the "tubers" should not be delayed long after the blooming period is over and the sterile tops have matured and died down, or at least have lost their green color. Immediately after blooming the plants seem to be dormant for about a month to six weeks before they again start making root growth. "Tubers" intended for the market should be dug at that time, which I do by making a trench at the end of the bed and then inserting the shovel under them, removing the supporting soil so that they topple over gently and expose the "tubers." These are then carefully removed and laid in flats and allowed to dry for a few days in a cool, dry, and well-ventilated place. After a few days they may be packed in alternate layers of dry peat moss and stored in a well-ventilated place until needed. "Tubers" treated in this manner have been stored until December without apparent injury and have been planted and grew as well as those planted earlier except that they were somewhat later in blooming.

Several attempts have been made to induce earlier flowering in the hardy species, *A. aurantiaca* and *A. chilensis*, but so far these attempts have not been as successful as desired. Mature "tubers" have been planted in six inch pots and placed in an open coldframe where they were subjected to outdoor conditions until December when the frame was covered with glass and gentle heat given to encourage a good healthy growth. The results were most gratifying but there has been no evidence of flowering stems. The treated plants however bloomed about two weeks earlier than those left out in the field. Possibly a lengthened day might give the desired results, but this factor has not been checked. "Tubers" of *A. Ligtu.* variety *angustifolia*, (from Constable's Gardens, Tunbridge Wells, England), were established in five gallon cans and placed in a coldframe which was covered with glass about the first of October and kept above the freezing point all during the winter. This treatment induced them to bloom about a month earlier than *A. chilensis* under similar treatment. Whether *A. Ligtu.* var. *angustifolia*, (I am not too sure of this name being correct), is more easily forced than other species not included in the experiment, I do not know at this time.

While the hardier species do not respond readily to forcing, the semi-hardy species *A. pulchra* will bloom from four to five weeks earlier if given a warmer situation than the controls in an unheated coldframe. Likewise the tender species *A. pelegrina* and its variety *alba*, in a warmer situation, will bloom from a month to six weeks ahead of those held in a coldframe just above the freezing point.

The latter alstroemerias and the bomareas coming from the warmer parts of the Andes and Brazil must be kept in a warm greenhouse free from frost. The bomareas tend to be evergreen and being inhabitants of the wooded areas do not seem to mind our sunless days as much as the outdoor alstroemerias and possibly for this reason bloom more or less intermittently throughout the year regardless of the season.

8. SOCIETY'S PROGRESS *

SECRETARY'S MAILBAG

This year we have bloomed for the first time a new strain of hybrid *Hemerocallis*, the bicolors of Clint McDade, a confirmed plant enthusiast and capable hybridizer of Chattanooga, Tenn. Mr. McDade informs us he derives these bicolor types from the offspring of a single fulvous type seedling. His named varieties include *Gayety*, *Charity*, *Charm*, *Cheerfulness*, *Vanity* and *Sunbeam*, in his "Bright Morning Series," lovely plants with delightful names; then he has *Queen Bess*, *Martie Everest*, *Jean*, *Dorris Doe*, *Vestal*, *Mermaid*, *Star of Tennessee* and *Swan Song*.

The secretary calls your special attention to the fine photographs of A. C. Buller's hybrid *Amaryllis*, which are included as illustrations in this *Herbertia*. They represent years of work by Mr. Buller, a sincere plant enthusiast and hybridizer. It goes to show, that given the opportunity, the fundamental material and the will to achieve, what can be done toward horticultural perfection and sheer beauty of flowers in a far corner of the world.

Dr. J. C. Th. Uphof, world famous botanist, has taken a position with the United States Department of Agriculture in the work of the Office of War Economics and the Bureau of Standards. He was formerly connected with Rollins College Winter Park, Florida, and has contributed important articles to *Herbertia* especially on *Amaryllis* nomenclature.

R. H. Gore of Ft. Lauderdale, formerly executive secretary of the Society, has been elected the first official Florida representative on the board of trustees of the American Orchid Society. Mr. Gore, a former governor of Porto Rico, once planned to have an "Amaryllis Room" in a hotel he owns at Ft. Lauderdale.

Prof. Dr. A. Fernandes, of the Instituto Botanico of the University of Coimbra, Portugal, is not as well known in America for his cytological, and systematic researches into the *Narcissus* group as might be, and it is hoped that the award of the 1942 Herbert Medal to this distinguished European plant scientist will help to draw attention to his work, most of which has appeared in the French language.

Arthington Worsley, dean of the Amaryllid fraternity of England, sends us further notes on his difficulties with gardening on the Isle of Wight, owing to labor shortage, lack of materials, and his own infirmities of age. For a time he was invalided, but latest reports are more hopeful and state that he is able to be around and work a little among his plants again. Mr. Worsley is in his early 80's.

* The material in this section was prepared by Mr. Wyndham Hayward, the never tiring Secretary of the Society. We all owe him a very great debt of gratitude for all that he has accomplished for the advancement of the amaryllids.
—Hamilton P. Traub

From Australia, Fred M. Danks, another true plantsman and outstanding poppy breeder, writes concerning the success of his idea of increasing stocks of nerines by raising seedlings. He reports that just lately he "gathered a nice crop of *Nerine* seeds and am keen to see what colors show." A friend, he says, gained a really outstanding range of color types from the first batch. Mr. Danks is endeavoring to arrange for some Australian authorities to write on the Amaryllid history and activities of the far Southern continent, and adds "Everyone here is behind MacArthur."

Miss Charlotte M. Hoak, roadside beautification chairman of the California Garden Clubs, Inc., writes that her first introduction to the Amaryllis Family was some bulbs of *Vallota speciosa*, which her father grew to perfection. She states that *Vallota* seems variable in its growing adaptability around Southern California, doing well in parts of Los Angeles, Glendale and Hollywood, but not seeming to thrive in South Pasadena. We have noted the same variability in Florida with certain bulbs. We hope to be able to get Miss Hoak to write some of her Amaryllid gardening experiences for *Herbertia* in the future.

Sir Henry J. Lynch, of Rio de Janeiro writes:

All your yearbooks are exceedingly interesting and help me in making a more intelligent study of these plants. There are many varieties in my neighborhood, and I hope to make a comprehensive collection of our native bulbs here. After some difficulty I have succeeded in obtaining a number of the Blue Amaryllis, (A. procera), "Empress of Brazil, and I have them under special observation. The Blue Amaryllis thrives within a relatively short distance of my place, which is situated behind the Organ Mts., and when in bloom their color is visible even to the marked eye but they are always situated in difficult surroundings and it is not easy to find men willing to fetch them. The mature bulbs are heavy and cumbersome which adds to the danger of gathering them.

That must be about as near Amaryllis heaven as may be . . . in our opinion, to have a villa with a view of distant Blue Amaryllis in bloom across the valley. Lucky Sir Henry.

We sent a plant of the daylily "*Duchess of Windsor*" to the Duchess herself in the Bahamas last spring, and were pleased to have a note from the Duchess' secretary that the royal lady had "planted it herself."

Swapping bulbs with Mr. George H. Hamor of the Dominican Republic, a transplanted Yankee in the tropics, is a fruitful and pleasing affair, as Mr. Hamor has found colonies of two rare and interesting *Zephyranthes*, *Z. bifolia* (syn. *Habranthus cardinalis*) and *Z. plumieri*. This last is a new white species, not yet well known or thoroughly studied. However for best results, the swapping has to be done by air mail in these times of troublous shipping, and that costs 20c an ounce.

Mr. George Gilmer, daylily fan of Charlottesville, Va., states that he takes up and moves his older clumps of daylilies any time of year when he can get to it. Choice new ones, for which he wishes to assure

maximum growth, he moves in early spring or late fall. This seems to correspond with our own experience with daylilies in Florida as well.

The Dade County Gardeners Association, with headquarters in the Miami area, has prepared interesting papers for the horticultural enlightenment of garden lovers on various phases of tropical and subtropical plant life, but of special interest to AAS readers are two on *Amaryllis* and *Hemerocallis* in South Florida, which were from the pen of W. A. Geiger, Society member in Miami Beach.

We have heard of two new and interesting *Hemerocallis* test plantings this year, one sponsored by the Botany Department of the University of Chicago at Lake Geneva, Wis., where Professor Kraus has already accumulated more than 600 so-called named varieties of daylilies, and the other at Swarthmore, in charge of Philadelphia's eminent John C. Wister, landscape architect and plantsman extraordinary. Mr. Wister is an old friend of Dr. A. B. Stout, and recently received the Hoyt horticultural award at Swarthmore.

Dr. L. H. Bailey, dean of the American horticultural fraternity, has a few kind words to say about HERBERTIA, Vol. 8, 1941: "I went through it carefully with much interest and thought it a particularly good number. I trust you will continue to find satisfaction in this important work."

An interesting account of the American Amaryllis Society and its work and publications appeared in "The Stamen," for August, 1942, the official publication of the Men's Garden Club of Pittsburgh. Ray Birch is editor of this enterprising sheet for male garden lovers.

In the July 1942 issue of the *National Horticultural Magazine* appears an interesting article on E. K. Ball's experiences in collecting plants in Latin America, with Amaryllids coming in for important treatment. William Lanier Hunt touches on Alstroemerias, and *Zephyranthes* in an article, "Fine Bulbs for Fall Planting," in "*Home Gardening*," for September 1942.

The following note from Major Albert Pam in England speaks for itself:

London, 28th August, 1942.

In the last issue of HERBERTIA you asked any reader who had witnessed the Festival of Amancaes near Lima to send you a report about this. I have never seen this festival, but your note did remind me of an amusing experience which I had regarding this locality. Some 30 years ago I went to Lima for the opening of the newly constructed railway line from Lima to Ancon, as I was a director of the Company which had constructed this line. A special train was provided for me and we were going over this new railway for a celebration which had been arranged at Ancon when looking out of the window I saw some flowers alongside the railway line and immediately jumped up and pulled the communication cord to stop the train. This was the first time and the last that

*I have ever stopped a train in this way, but as it was my own train it did not matter so much. I jumped out on the line, followed by the officials of the railway who could not make out what I was doing. I pointed out to them the beautiful flowers of *Ismene Amancaes* and told them to bring some shovels to dig up as many bulbs as possible. This worried them a great deal, as they said that we should be late for the celebrations at Ancon if we wasted any time on the way, and so they promised that they would mark the spot and stop the train on the way back to enable me to dig up the bulbs. Later that day on our return to Lima the train was stopped at the spot where thousands of these *Ismene* were growing within a few yards of the railway, and with the help of the engine driver's shovels I was soon able to collect a good number of these bulbs, some of which are still growing in my glass houses and flower regularly every year.*

“The Georgia Magazine,” a Sunday supplement of the Macon, (Ga.) *Telegraph and News*, contained an interesting illustrated article on the gardens of Mr. and Mrs. William Wood in that city. Mr. Wood is a *Hemerocallis* fancier and also is famous for his plantings of iris. He is an inveterate hybridizer and is specializing in daylily crosses and breeding. His collection of named daylily varieties includes more than 150 varieties.

SECRETARY'S MESSAGE

The 1942 *HERBERTIA* comes off the presses under the stress of War, under all the disadvantages that this can mean to the peaceful pursuit of horticulture, and your Society takes pride in what is now offered to you in spite of these many and varied difficulties.

Your officers have assumed many new duties in their personal lives and public activities, connected with war work, and consequently the time and attention given to the affairs of the American Amaryllis Society have come hard and in less regular sequence. However, the love of bulbs and bulb gardening (including with this also *Hemerocallis* and *Alstroemeria*) has carried the organization through to new successes.

Never has mankind felt the necessity more, than now, to turn, where this may be possible for the individual, to the “lift,” the recreation, of a bit of garden work or plant discussion, or the reading of some interesting article on favorite plants and bulbs. If the reading of this yearbook gives the members and friends of the Society even a part of the refreshing stimulation and helpful build-up of “morale” that it has given the officers and contributors who have shared in its production, it will have served some worthwhile purpose in the busy world of total war.

The Society is also proud that it was able to continue its uninterrupted series of National Amaryllis shows with the holding of its 9th annual exhibition at Orlando, Florida, in the Spring of 1942. The show was viewed by thousands attending a “pioneer celebration” of Central Florida, of which the Amaryllis show was a featured event. The best cooperation of community and growers, including garden clubs, chamber of commerce and city officials, was provided in arranging the show.

Your Editor, Dr. Hamilton P. Traub, has been moved to California, in the passing year, to help with the Emergency Guayule Rubber Project at Salinas Calif., far removed—some 2500 miles—from the printer and society headquarters, but has met this new problem with undiminished energy and resourcefulness. In his new location he has already purchased a home and is starting a new collection of Amaryllids and their near relations.

From our numerous California members we hear he has been spreading the good word of Amaryllid enthusiasm up and down the Pacific Coast, in what little time he has to spare from his scientific research for the United States Department of Agriculture. This new location should afford him interesting opportunities for the comparison of Amaryllid cultures in the two great centers of outdoor sub-tropical gardening, following his several years of residence in Florida where he developed an extensive collection of many genera and began his important work of hybridizing experiments with *Amaryllis*, *Hemerocallis*, etc.

From England Major Albert Pam sends us his usual interesting and informative reports on the much-reduced activity in Amaryllid growing there. The vital spark of enthusiasm still burns bright in the British Isles, and while we all put aside many things we would like to do with our bulbs and plants in these times of trial, may an early peace bring on a new and greater revival of interest in Amaryllid culture than ever before.

October 23, 1942
Lakemont Gardens,
Winter Park, Florida

WYNDHAM HAYWARD,
Secretary.

REPORT OF TRIAL COLLECTIONS COMMITTEE

The Trial Collections Committee reports only a few additions to the Society's stock of interesting new and rare Amaryllids for 1942. This situation is one of the results of the War and little outlook for improvement is seen for the duration. Members are still urged to remember the Society with interesting and unusual seeds and bulbs of any plants in its field not commonly grown in the United States when they have them to spare, or come upon them in their travels.

A-307—*Zephyranthes Pulmieri* (?) bulbs from George H. Hamor, Dominican Republic.

A-308—Bulbs of *Zephyranthes bifolia*, color variations, from same contributor.

A-309—Bulbs of *Zephyranthes insularum*, from several gardens on East and West coasts of Florida (cultivated bulbs).

A-310—Seeds of choice *Clivia* hybrids, from Major Albert Pam, England.

A-311—Seeds of *Cyrtanthus Tuckii* var. *transvaalemsis*; collected by J. P. Botha, in open grass country, Athole Pasture Research Station, Ermelo, Transvaal, South Africa; and sent to the Society by Dr. R. A. Dyer, Principal Botanist, Division of Plant Industry, Dept. of Agric., Pretoria; 12-26-41.

—W. HAYWARD,
Chairman.

NOTICE OF 1943 NOMINATIONS

To the members of the American Amaryllis Society:

As approved by Article 5, Section 1, of the By-Laws of the American Amaryllis Society, which specifies that the secretary shall send to all voting members not less than 90 days before the date of the annual election, a list of the offices to be filled and the names of those whose terms expire, this information is hereby incorporated in the data below, and same will take the place of a mailed notice to the members to this effect for the 1943 election:—

President	Mr. E. G. Duckworth
Vice-Presidents	Mr. T. H. Everett
	Mr. E. A. McIlhenny
	Mr. Fred H. Howard
Secretary	Mr. Wyndham Hayward
Treasurer	Mr. R. W. Wheeler
Director-at-large for 3 years	Mr. W. M. James

Article 7, Section 1 of the Constitution, provides that any voting member may submit to the Secretary, not less than sixty days before the annual meeting, nominations for officers and directors. These shall be submitted to a nominating committee, who shall select the candidates for the final ballot.

The Annual Meeting of the Society in 1943 will be held on the second Wednesday in April, as provided by Article 10, Section 1, of the Constitution, this being April 14, 1943. Therefore the names of nominees must be submitted by the voting members to the Secretary before February 17, 1943.

WYNDHAM HAYWARD,
Secretary.

October 1, 1942.
Winter Park, Florida.

The Secretary would like to take this opportunity of calling to the attention of members again the desirability of adding new members and enlarging the field of the Society by bringing it to the attention of horticulturists and garden lovers everywhere. The 1942 Year Book, we hope, will be considered a notable example of the Society's constant efforts to bring together the latest research, the newest accurate and useful information and interesting illustrations concerning the important Amaryllis family. The income of your Society is used solely for the publishing of its Year Book, the holding of Amaryllis exhibitions, and generally supporting the other worthy aims of the organization.

OFFICERS AND DIRECTORS of the AMERICAN AMARYLLIS SOCIETY 1942-43

PRESIDENT—Mr. E. G. Duckworth, *Orlando, Florida*

VICE PRESIDENTS—Mr. T. H. Everett, *New York, N. Y.*

Mr. E. A. McIlhenny, *Avery Island, La.*

Mr. Fred H. Howard, *Montebello, Calif.*

SECRETARY—Mr. Wyndham Hayward, *Winter Park, Florida*

TREASURER—Mr. R. W. Wheeler, *Orlando, Florida*

DIRECTORS-AT-LARGE—Term expiring in 1943,

Mr. W. M. James, *Santa Barbara, Calif.*

Term expiring in 1944, Mr. Jan de Graaff, *Sandy, Ore.*

Term expiring in 1945, Dr. H. P. Traub, *Salinas, Calif.*

EDITOR, HERBERTIA

Dr. Hamilton P. Traub

FELLOWS OF THE SOCIETY

Mr. A. Worsley

Miss Ida Luyten

Prof. Ferdinand Pax

Dr. J. Hutchinson

Mr. Ernst H. Krelage

WILLIAM HERBERT MEDALISTS

Mr. A. Worsley, *Eng.*

Mr. Ernst H. Krelage, *Holland*

Mr. Cecil Houdyshel, *Calif.*

Maj. Albert Pam, *Eng.*

Mr. Pierre S. du Pont, *Del.*

Mr. Jan de Graaff, *Oregon*

Mr. Fred Howard, *Calif.*

Mr. Percy Lancaster, *India*

Dr. J. Hutchinson, *Eng.*

Mr. Carl Purdy, *Calif.*

Dr. A. B. Stout, *N. Y.*

Mr. H. W. Pugsley, *Eng.*

Mr. W. M. James, *Calif.*

Prof. Dr. A. Fernandes, *Portugal*

CORRESPONDING MEMBERS

Antilles—Dr. H. C. Gray, *Atkins Institution, Cienfuegos, Cuba*

Argentina—Sr. Jose F. Molino, *Buenos Aires*

Australia—Mr. Fred M. Danks, *Canterbury, Victoria*

Brazil—Sr. Joao Dierberger, *Sao Paulo*

Canada—Mr. John S. Lotan, *Hull, Quebec*

Central America—Mr. Alan Kelso, *Punto Arenas, Costa Rica*

England—Major Albert Pam, *Broxbourne, Herts.*

Holland—Mr. Ernst H. Krelage, *Haarlem*

India—Mr. Syney Percy-Lancaster, *Alipur, Calcutta*

Kenya Colony, East Africa—The Lady Muriel Jex-Blake, *Nairobi*

Union of South Africa—Mr. R. A. Dyer, *Pretoria*

Venezuela—Dr. H. Pittier, *Caracas.*

STANDING COMMITTEES

MEMBERSHIP Chairman

Southwest: Mr. Gordon Ainsley, *Calif.*

South Midland: Mr. J. L. Gebert, *La.*

Southeast: Mrs. John H. Churchwell, *Fla.*

Northwest: Mr. H. L. Stinson, *Wash.*

North Midland: Mr. Robert Schreiner,
Minn.

Northeast: Mr. Robert Wyman, *N. Y.*

Hawaii: J. Montague Cook, Jr., *Honolulu*

Canada: Mr. John S. Lotan, *Quebec*

FINANCE AND AUDITING—Mr. E. G. Duckworth, *Chairman*
Mr. Wyndham Hayward Dr. Hamilton P. Traub

PUBLICATIONS—Dr. Hamilton P. Traub, *Chairman*
Mr. T. A. Weston Mr. R. W. Wheeler

EXHIBITIONS AND AWARDSChairman
Southwest: Mr. Fred H. Howard, *Calif.* North Midland: Mr. C. W. Davison,
South Midland: Mr. E. A. McIlhenny, *Wisc.*
La. Northeast: Mr. Arno Nehrling, *Mass.*
Southeast: Mr. R. W. Wheeler, *Fla.* Hawaii: J. Montague Cook, Jr., *Honolulu*
Northwest: Mr. W. L. Fulmer, *Wash.* Canada: Mr. J. B. Pettit, *Ontario*

TRIAL COLLECTIONS—Mr. Wyndham Hayward, *Florida, Chairman*
Southwest: Mr. W. M. James, *Calif.* North Midland: Mr. D. A. Humphrey,
South Midland: Dr. W. S. Flory, *Tex.* *Minn.*
Southeast: Mr. A. T. Coith, *Fla.* Northeast: Mr. Pierre S. du Pont, *Del.*
Northwest: Mr. H. L. Stinson, *Wash.* Hawaii: Dr. J. H. Beaumont, *Honolulu*
Canada: Mr. A. E. Challis, *Ontario*

RESEARCH—Dr. L. H. MacDaniels, *Chairman*
Mr. W. M. James; Mr. Jan de Graaff;
Dr. Hamilton P. Traub;

SPECIAL COMMITTEES

NOMENCLATURE AND DESCRIPTION—Dr. Hamilton P. Traub, *Chairman*
Mr. W. M. James Mr. T. A. Weston

HEMEROCALLIS (DAYLILY)—Mr. Elmer A. Claar, *Chairman, Wilmette, Ill.*
Mr. Robert Schreiner, *Minnesota* Dr. V. T. Stoutemyer, *Maryland*
Mr. J. Marion Shull, *Maryland* Mr. David F. Hall, *Illinois*
Dr. Hamilton P. Traub, *California* Mr. Wyndham Hayward, *Florida*
Prof. H. B. Dorner, *Illinois* Mr. Donald B. Milliken, *California*
Dr. J. S. Cooley, *Maryland*

[Additional members to be appointed later; members of the Hemerocallis Jury are ex-officio members.]

HEMEROCALLIS JURY FOR EVALUATING DAYLILIES—Dr. L. H. MacDaniels,
Chairman, Cornell University, Ithaca, N. Y.

Those in charge of Official Cooperating Trial Gardens are ex-officio members of the Daylily Jury.

[Reports from official trial gardens, indicated below, should be made directly to Dr. MacDaniels, Chairman, by July 1 in order to be included in annual summary for *Herbertia*.]

OFFICIAL COOPERATIVE DAYLILY TRIAL GARDENS

Prof. John V. Watkins, in charge of Daylily Trial Garden, College of Agriculture, University of Florida, Gainesville, Fla.	Dr. Raymond C. Allen, in charge of Daylily Trial Garden, Dept. of Floriculture, Cornell University, Ithaca, N. Y.
Dr. Paul L. Sandahl, Supt., in charge of Daylily Trial Garden, Dept. of Parks & Public Property, City of Des Moines, Iowa.	Dr. Walter S. Flory, in charge of Daylily Trial Garden, Division of Horticulture, Texas Agric. Expt. Sta., College Station, Texas.
Prof. Ira S. Nelson, in charge of Daylily Trial Garden, Dept. of Horticulture, Southwestern Louisiana Institute, Lafayette, La.	Mr. Chas. E. Hammersley, 714 Majestic Building, Milwaukee, Wisc., in charge of Daylily Trial Garden, Milwaukee City and County Parks.

Note.—Introducers of new daylily clones should send plants directly to the Trial Gardens for testing.

ALSTROEMERID—Mr. H. L. Stinson, *Chairman, Seattle, Wash.*
Mr. W. M. James, *California* Mr. John F. Ruckman, *Pennsylvania*
Mr. L. S. Hannibal, *California*

CALLICOREAE—Mr. L. S. Hannibal, *Chairman, Concord, Calif.*
Mr. Arthington Worsley, *England* Mr. W. M. James, *California*

ALLIDEAE—Bernard Harkness, *Chairman, Baraboo, Wisc.*

PUBLICATIONS OF THE AMERICAN AMARYLLIS SOCIETY

A complete file of HERBERTIA, the year book of the American Amaryllis Society, is indispensable to all who are interested in Amaryllids. A limited number of copies of the following are still available:—

Volume 1 (1934). Containing the biography of Henry Nehrling, and many valuable articles on amaryllids; with a portrait of Henry Nehrling and 16 other illustrations; a total of 101 pages.

Volume 2 (1935). Containing the autobiography of Theodore L. Mead, and many excellent articles on varieties, breeding, propagation, and culture of amaryllids; with portraits of Theodore L. Mead and David Griffith and 18 other illustrations; a total of 151 pages.

Volume 3 (1936). Containing the autobiography of Arthington Worsley, and important articles on description, genetics and breeding, physiology of reproduction, and amaryllid culture; with 3 portraits of Arthington Worsley, one color plate and 30 other illustrations; a total of 151 pages.

Volume 4 (1937). Containing the biography of William Herbert; the reprint of Herbert's essay, on Crosses and Hybrid Intermixtures in Vegetables; Dr. Darlington's essay, The Early Hybridizers and the Origins of Genetics, and many important articles on description; cytology, genetics and breeding; physiology of reproduction, and amaryllid culture; with two portraits, forty-four other plates and three figures; a total of 280 pages.

Volume 5 (1938). Containing the autobiography of Ernst H. Krelage; the history of amaryllid culture in Holland by Ernst H. Krelage, Dr. Uphoff's important article in which the name *Hippeastrum* is rejected; a revision of the tribes of the Amaryllidaceae; and the species of Amaryllis; outstanding articles on forcing amaryllids by Dr. Grainger and Prof. Dr. van Slogteren; and many other articles on description, cytology, genetics and breeding; physiology of reproduction, and amaryllid culture; with 33 plates and 2 figures; a total of 218 pages.

Volume 6 (1939). Dedicated to the Union of South Africa, and containing articles on South African amaryllids, including the history of botanical exploration for amaryllids in South Africa, the distribution of South African amaryllids in relation to rainfall, and a review of the Genus *Agapanthus* by Frances M. Leighton; a review of the Genus *Cyrtanthus*, with many excellent line drawings, by Dr. R. A. Dyer; other articles—*Zephyranthes* of the West Indies by Dr. Hume; the Tribe *Gilliesiae* by Dr. Hutchinson; rating of daylilies for garden value by Mr. Kelso; daffodil articles by Jan de Graaff, and many other items on description, cytology, breeding, propagation, and amaryllid culture; with 44 plates and 10 figures; a total of 258 pages.

Volume 7 (1940). Dedicated to Latin America, and featuring articles on Latin American amaryllids; biographies of Drs. Philippi and Holmberg; report by Dr. Goodspeed on the amaryllids collected by the Univ. of Calif., Second Andean Expedition; reports on the flowering of the "Blue Amaryllis," *A. procera*; and many other important articles on the description, propagation, breeding, culture, harvesting and storage of amaryllids. Of special interest are the important articles on the

description, breeding and culture of daylilies by noted authorities. With 45 illustrations—30 plates and 15 figures—and a total of 242 pages.

Volume 8 (1941). Daylily Edition. The first extensive symposium on the daylily, containing biographies of George Yeld, Amos Perry, Hans Sass, and Paul Cook, and important articles on daylily evaluation, breeding, propagation and culture. Also important articles on *Narcissus* and other amaryllids. Thirty-eight illustrations—27 plates and 11 figures—and a total of 185 pages.

Volume 9 (1942). Alstroemerid Edition. Dedicated to Harry L. Stinson, the outstanding authority on this plant group, who contributes a summary of his work on Alstroemerid taxonomy, breeding, propagation and culture. This volume contains the autobiography of Prof. Dr. Abilio Fernandes, the Check-List of Amaryllids by Major Pam, and a review of the species of *Crinum* by Dr. Uphof, and also many important articles on daylilies, *Narcissus*, *Cyrtanthus*, hybrid *Amaryllis*, *Ixiolirion* and other amaryllids. Thirty-two illustrations—18 plates and 14 figures—and a total of 243 pages.

The prices of the above described volumes are based on the available supply:

- Volume 1, 1934, very scarce, \$3.75 each, postpaid.
- Volume 2, 1935, very scarce, \$3.75 each, postpaid.
- Volume 3, 1936, \$3.75 each, postpaid.
- Volume 4, 1937, (double number), \$4.25 each, postpaid.
- Volume 5, 1938, \$3.25 each postpaid.
- Volume 6, 1939, \$3.25 each, postpaid.
- Volume 7, 1940, \$3.25 each, postpaid.
- Volume 8, 1941, \$3.25 each, postpaid.
- Volume 9, 1942, \$3.25 each, postpaid.

Herbertia in sets postpaid to members:

- | | |
|----------------------------------|----------|
| Vols. 1, 2 & 3 | —\$10.00 |
| Vols. 1, 2, 3 & 4 | —\$13.00 |
| Vols. 1, 2, 3, 4 & 5 | —\$16.00 |
| Vols. 1, 2, 3, 4, 5 & 6 | —\$18.50 |
| Vols. 1, 2, 3, 4, 5, 6 & 7 | —\$21.00 |
| Vols. 1, 2, 3, 4, 5, 6, 7 & 8 | —\$23.50 |
| Vols. 1, 2, 3, 4, 5, 6, 7, 8 & 9 | —\$26.00 |

Make checks payable to the American Amaryllis Society, and send orders to the Secretary,

Mr. Wyndham Hayward,
Winter Park, Florida.

DATA CARD FOR HEMEROCALLIS

When describing daylily clones, all breeders and growers are requested to use the Official Data Card for Hemerocallis, devised by the eminent artist and horticulturist, J. Marion Shull, and fully described in HERBERTIA, Vol. 7, 1940. These cards should not only be used in describing new clones but also for the description of all older clones grown in the various climatic regions.

These cards are available at present in the 3 inch by 5 inch size at the nominal price of \$1.00 per hundred, to pay for printing, handling and postage. Send orders to—

*Wyndham Hayward, Secretary,
Winter Park, Florida*

THE BUYERS' GUIDE

MAKE A GARDEN FOR RELAXATION

Arcadia, California,
August 11, 1942

Dear George:

In these days of struggle and turmoil it is inevitable that some of us should receive more than our share of grief and privation. Believe me, George, when I say that my sympathies are with you. I would do anything to help you regain the physical strength and moral courage that was yours before Pearl Harbor. Forgive me if I appear to presume to advise my elder, but I have been thinking a lot lately and observing a few things which I want to pass on to you for what they might be worth.

George, it is doing you no good confining yourself to your room and brooding, reading, playing solitaire, reading and brooding. What is more important, it is not doing the rest of us any good. This is no time for inactivity. Each one of us has a duty to perform towards mankind and that duty cannot be performed unless we are mentally and physically fit. Unfortunately, I am neither a physician who can heal your body nor a clergyman who can uplift you spiritually. I am only a plain dirt (and often dirty) gardener, but I see the light in my own humble way.

Take down the Good Book, George, and open it at the very beginning of the second chapter, and here is what you will find,—“And the Lord God PLANTED A GARDEN eastward in Eden; and there He put the man whom He had formed.” It seems to me that the Lord knew what he was doing when he put man into a garden instead of a house or cave or some such place.

I know a woman in Los Angeles who, like yourself, lost her son at Pearl Harbor. She became a total wreck and nearly lost her mind. One day, in sheer desperation, she went out into the garden. That was the turning point. She discovered the supreme joy of growing flowers. She became interested in collecting and breeding just one kind of flower, but that was enough to give her a renewed interest in life. Today she is well and active, and revenging Pearl Harbor by helping in the war effort; something she could not have done had she kept to her room. It is not hard to understand the change that was brought about in her attitude either. You have been a father. You know the joy of bringing up a child in good health, watching it develop day by day, court and get married. I am sure you never forgot the happiness that you felt that day when they came to visit you and brought with them their own child. You remember, don't you? Well, George, you feel a similar happiness every time that a plant that you yourself have grown bursts out into bloom.

You need not take my word for it. Just look about you and you will find that the most contented people are those who work with the soil. That is because they are healthy in body and mind. You will find that a great majority of clergymen are interested in gardening. The physicians go for it in a big way, and they ought to know what is good for them. Here in Los Angeles there is a very large and active garden club that is composed of physicians exclusively.

So as a friend who is truly interested in your well-being I am taking the liberty to suggest that you get out into your back yard and plant flowers. I know you will say that you know next to nothing about them. But remember that once you get started you will learn. Send for all kinds of catalogs. The dealers are most happy to send them to you. You will find them instructive and interesting. You need not grow all the kinds of flowers under the sun. That is impossible. Just confine yourself to one family, say amaryllids, or even to one genus like Amaryllis, Crinum, or Narcissus. You will find that you will have plenty of fun collecting all of the wild forms and many of the named hybrid varieties. Try cross breeding these as they flower and raising seedlings from these crosses. Before you know it you will have an entirely different outlook on life. You will never forget Pearl Harbor, but more important, you will be in shape to do your part in defeating the “Axis.”

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HERBERTIA

VOLUME 10

10TH. ANNIVERSARY EDITION

EDITED BY

HAMILTON P. TRAUB

SALINAS, CALIFORNIA

THE AMERICAN AMARYLLIS SOCIETY

1943

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AMERICAN AMARYLLIS SOCIETY

Printed in the United States of America

Published July, 1944

Address correspondence and send membership dues to:

Mr. L. S. Hannibal, Executive Secretary,
Concord, California.



This volume contains a total of forty-one illustrations, twelve plates and twenty-nine [text] figures.

ERRATA

HERBERTIA, VOL. 10, 1943

Cover; due to an error by the engraver, some copies of Vol. 10 were sent out with "1944" on cover; on these "1944" should be changed to "1943."

Page 49; species no. 17, for "Gray" read "Grey, Hardy Bulbs."

Page 52; 15th. line from bottom, for "family" read "finally."

Page 53; 7th. line from top, for "1853" read "1753."

Page 54; 2nd. line from top, for "distichously or spirally" read "not biflabellately."

Pages 83, 87, and 88; Fig. 94, and Plates 245 and 246, for "*gen. nov.*" read "*comb. nov.*"

Page 96, Fig. 96, for "*ovallaris*" read "*obvallaris*."

Page 101, 3rd. line from bottom, for "*Beckhouse*" read "*Backhouse*."

Page 116, 16th. line from top, for "*Lyconis*" read "*Lycoris*."

17th. line from top, for "*Stenbergia*" read "*Sternbergia*."

Page 118, 16th. line from top, for "*volubil*" read "*volubile*."

Page 131, title at top. after "DICHOGAMY AND INTERSPECIFIC STERILITY" add "IN ALSTROEMERIA."

Page 194, 9th. line from bottom, for "Cpl." read "Sgt."

Page 195, 22nd line from bottom, for "Uphoff" read "Uphof."

Page 196, 29th. line from top, for "thirty-eight" read "forty-one"; for "18" read "12"; and for "20" read "29".

30th. line from top, for "225" read "205."

HERBERTIA



1944

INTRODUCTION

MAJOR ALBERT PAM, O. B. E., F. L. S.

Corresponding Member for Great Britain

At the last flower show of the Royal Horticultural Society for the 1943 season, an old friend, who is a member of the Council of that Society and one of our most experienced horticulturists, said to me: "HERBERTIA is by far the best specialised botanical periodical published anywhere!" Coming from a sedulous reader of all gardening and botanical literature, this is praise indeed and the compliment was entirely unsolicited, as we had been speaking of a copy of Mrs. Bury's HEXANDRIAN PLANTS which came from the library of the late Arthington Worsley and was being offered by a well known bookseller. I fully share this appreciation of the journal of the American Amaryllis Society, and have therefore written this short review of the past nine issues of HERBERTIA in celebration of its 10th birthday with the 1943 number. It has progressed from strength to strength, and this is due only to the energy, devotion and skill of its Editor, Dr. Hamilton P. Traub, who has been responsible for its publication during the whole period since 1934. He has assembled articles to suit all tastes, from the purely scientific contributions of noted botanists, to the experiences of amateur gardeners, who have told of their first efforts in the cultivation of some particular species of the Amaryllidaceae. All lovers of this family of plants have been catered for, and in this respect HERBERTIA is quite unique—in no other horticultural periodical is the content so widespread or so varied.

In looking through the first nine numbers one finds that some of the contributions to systematic botany are outstanding and almost revolutionary, none more so than the article in Volume 5 by Professor J. C. Th. Uphof on "The History of Nomenclature—*Amaryllis* (Linn.) Herb, and *Hippeastrum* (Herb.)", in which the generic name *Hippeastrum* was discarded in favour of *Amaryllis*, and the plant known till then as *Amaryllis belladonna* reverted to *Callicore rosea*, the name proposed in 1829 by Link. This was indeed a shattering change for those who liked the century old names and regretted their disappearance, but so eminent a botanist as Sir William Wright-Smith, Regius Professor of Botany at Edinburgh, after a full study of the position, decided that the change was inevitable under the recognised rules of nomenclature. This article by Professor Uphof led to a revision by Dr. Traub, in the same number of HERBERTIA, of the tribes of the Amaryllidaceae, which introduced a number of changes necessitated by the rejection of the name *Hippeastrum*, and by his own researches into the classification of the family, and this revision is now accepted pending the appearance of the new work AMARYLLIDACEAE by Dr. Traub, which is looked forward to by all his friends as soon as the present war is over. Other important botanical articles have been contributed by Dr. H. Harold Hume on *Zephyranthes*; by Dr. A. B. Stout on *Hemerocallis*. It would be impossible in this short review to mention other noteworthy contributions of botanical interest.

Culture and reproduction have been so adequately dealt with in the first nine numbers of HERBERTIA that growers of Amaryllids need hardly seek further advice and help. Unfortunately, owing to different climatic and soil conditions, there is no guarantee that, even by following exactly the procedure recommended, the same results will be obtained. Members of the A. A. S. should, however, continue to give others the benefit of their experience in the future as they have done in the past, and the culture of the beautiful and interesting species of the Amaryllidaceae will thus become better known and more popular in every part of the world. Special praise should be given to the quality of the illustrations of plants and flowers in the past nine numbers—it has been consistently excellent and the printers deserve great credit for the beautiful reproductions.

On behalf of British, and I feel sure of all other members of the A. A. S., I want to thank the officers of that Society and especially Dr. Hamilton P. Traub and Mr. Wyndham Hayward for the pleasure HERBERTIA has given us all in the past, and to wish them and the A. A. S. all good luck and prosperity in the future.

*November 9, 1943,
Wormley Bury,
Broxbourne, Herts.*

PREFACE

It is safe to say that the members will enjoy the delightful article in this issue of HERBERTIA by Miss Elizabeth Lawrence on amaryllids in a Southern garden. She is the author of that outstanding book, "A Southern Garden" (1942). All who read these refreshing chapters will note that she has added to the sum total of gardening knowledge from her ample gardening experience, and has also made effective use of new information that appeared during the past decade in such periodicals as HERBERTIA. In recognition of her important contributions to the advancement of horticulture, particularly the amaryllids, the Society has awarded the Herbert Medal for 1943 to Miss Lawrence, who also favors us with a brief autobiography in this issue that is dedicated to her.

It is with the deepest regret, and a feeling of personal loss, that we record the death of Mr. Arthington Worsley, and Mr. Gordon Ainsley. Both were charter members of our Society and helped to build it up. In Memoriam notices appear elsewhere in this issue.

Mr. J. Marion Shull has again favored us with a beautiful cover design that adorns this 10th. Anniversary Edition. He is a member of the talented Shull family, and we are honored to include in this issue a charming autobiography. Mr. Shull also contributes important articles on the daylily.

We wish to call your attention to the excellent photographic portraits of amaryllids contributed to this issue by Mr. W. M. James. Your attention is directed particularly to the illustration of *Bomarea Lehmanii*. He is to be congratulated on the realistic appearance of the fruits. Mr. James, who is now chairman of the Trial Collections Committee, also favors us with fine articles on amaryllids.

Word has been received that the Victoria Medal of Honour (V. M. H.) has been awarded to our good friend Major Albert Pam, O. B. E., F. L. S., by the Royal Horticultural Society for his outstanding work on the Amaryllidaceae. All of the members will join the writer in congratulating Major Pam on the receipt of this signal honor.

The V. M. H. was founded in 1897 "in remembrance of Queen Victoria's 60th. Jubilee 'to enable the Council to confer conspicuous honour on those British Horticulturists resident in the United Kingdom whom it might from time to time consider deserving of special honour at the hands of the Society.' The Medal was originally restricted to 60 recipients, but as the Queen lived for long enough to have reigned for 63 years, the number was increased to 63 which it still is."

The load of the Society's secretarial office has constantly increased until it was no longer possible for one man to take care of all the details as an avocation, and this made it necessary to secure the services of an Executive Secretary to carry part of the load. Mr. Hayward, who has served as Secretary since 1933 will carry on but his duties will be lightened. The Executive Secretary will have charge of the membership roster and will take over other details. Mr. Hayward, as Secretary, will concentrate on matters of policy and such details as symposiums. We owe Mr. Hayward a debt of gratitude for his long term of unselfish service, and his resolve to give us the benefit of his past experience in guiding the Society. He will also serve as Chairman of the Exhibitions and Awards committee.

The Society is fortunate that Mr. L. S. Hannibal has agreed to serve as Executive Secretary. By profession he is "a chemical engineer in a fixed nitrogen fertilizer plant where technical design problems in agricultural ammonia are his chief concern." By avocation he is a keen gardener and is particularly an amaryllid enthusiast.

The Society was organized in 1933, and later a committee was appointed to consider the project of incorporating the association. In 1943, the Society was finally incorporated under the Laws of the State of California. Consequently the headquarters have been transferred to California. This consummation will not affect the functioning of the Society in any way since the officers, including the Florida group, will carry on actively as in the past.

Dr. L. H. MacDaniels, Head of the Department of Floriculture, Cornell University, who has served as Chairman of the Daylily Jury and

Research Committee for the past three years, is on leave of absence in order to serve our country. He will be on a foreign mission until 1945. In his absence, Dr. Kenneth Post, Associate Professor of Floriculture, at Cornell, and now Acting Head of the Department, will serve as Acting Chairman of the Daylily Jury and the Research Committee.

Major Pam writes that Professor E. J. Salisbury, C. B. E., F. R. S. "has recently taken up the position of Director of the Royal Botanic Gardens, Kew. He is an eminent botanist, and has written some extremely interesting books, including one called 'The Living Garden,' which you may know."

The 10th. Anniversary Edition contains a wealth of amaryllid information. Dr. Uphof contributes a review of *Agapanthus* and *Tulbaghia* and Mr. Giridlian writes on the culture of members of these genera. Dr. Flory brings the valuable review of chromosomes of amaryllids up-to-date. Messrs. Powell, Reinelt, Reynolds and Berry contribute an interesting symposium on *Narcissus*. Mr. Hannibal presents a treatise on *Brunsvigia rosea* and hybrids and other articles on amaryllids. Dr. Stoutemeyer favors us with a review of the propagation of amaryllids. Due to space limitations it is not possible to mention the many other articles, including contributions on daylilies, *Haemanthus*, and other amaryllids.

The 1944 issue of HERBERTIA will be dedicated to the Onion Tribe, ALLIEAE. As a worth while contribution to the war effort, articles on the cytology, breeding and culture of the onion will be included. The excellent cover design, by Mr. J. Marion Shull, has already been received. It features the onion, *Allium Cepa*. Although the ALLIEAE will be singled out for attention in this issue, it should be noted that the other amaryllids will not be neglected. The regular quota of contributions from members on the many other amaryllids are again solicited. Kindly send in your articles soon so that 1944 HERBERTIA can be published by December, 1944. Most of the articles should reach the editor by August 15, if the book is to reach you by the date indicated.

It will interest the members to know that during the past decade a total of 368 illustrations have appeared in HERBERTIA. This is an average of thirty-six per year. The total number of printed pages of text for the ten year period is over two thousand.

December 15, 1943,
115 Carmel Avenue,
Salinas, California.

—Hamilton P. Traub

TABLE OF CONTENTS

10th. Anniversary Edition Cover Design, *Ixiolirion tataricum*,
J. Marion Shull

	PAGE
Introduction, Major Albert Pam	3
Preface	4
Errata, Volume 9, 1942	10
Note to Members and Librarians	11
Note to <i>Herbertia</i> Contributors	11
Dedication	12
Elizabeth Lawrence, an autobiography	13
Amaryllids in a Southern Garden, Elizabeth Lawrence	14
Herbert Medal Awards, 1937-1943, Hamilton P. Traub	24
Franklin B. Mead, a biographical sketch	26
In Memoriam—Arthington Worsley	27
In Memoriam—Gordon Ainsley	27
J. Marion Shull, an autobiography	29
John Vertrees Watkins, a biographical sketch, B. Y. L.	33
A Decade with Amaryllids, W. M. James	34
<i>Herbertia</i> Cover Designs, Hamilton P. Traub	36
1. REGIONAL ACTIVITY AND EXHIBITIONS	
Mid-West Garden Club of the Air, Darrell S. Crawford	38
2. DESCRIPTION, CLASSIFICATION AND PHYLOGENY	
Review of <i>Agapanthus</i> and <i>Tulbaghia</i> , J. C. Th. Uphof	40
The <i>Brunsvigieae</i> , Hamilton P. Traub	51
<i>Brunsvigia rosea</i> and hybrids, L. S. Hannibal	55
<i>Crinum Moorei</i> , clone Frank Leach, L. S. Hannibal	70
<i>Haemanthus coccineus</i> var. <i>albus</i> , Stanford, var. nov.	70
Display Garden at the University of Florida, John V. Watkins ...	72
The Texas Cooperative Daylily Garden, Walter S. Flory	73
Whitnall Park Daylily Trial Garden, Charles E. Hammersley ...	74
The Elmer A. Claar Daylily, A. B. Stout	76
Horticultural Classification of <i>Narcissi</i> , A. Simmonds	79
Genus <i>Worsleya</i> , Genus nov., <i>Amaryllidaceae</i> , Hamilton P. Traub	84
Amaryllid genera and species	90
The Naming of Horticultural Varieties, Donald Wyman	91
Registration of new amaryllid clones—	
Hybrid Daylily (<i>Hemerocallis</i>) clones	92
Hybrid Amaryllis clones	94
Hybrid <i>Narcissus</i> clones	94
Hybrid <i>Cyrtanthus</i> clones	94
Hybrid <i>Crinum</i> clone	94
3. CYTOLOGY, GENETICS & BREEDING	
Eighteen Years' Experience in Breeding <i>Narcissi</i> , Edwin C. Powell	95
<i>Narcissus</i> Breeding, Frank Reinelt	101
Rambles in the <i>Narcissus</i> Seedling Bed, S. Stillman Berry	105
Steps in producing hybrid <i>Narcissi</i> , Kenyon L. Reynolds	109
<i>Narcissi</i> from seeds, Kenyon L. Reynolds	111

Chromosome Numbers Reported in Recent Years for Hemerocallideae, Alstroemeriales, and Amaryllidales, W. S. Flory	114
Amaryllis Breeding Report, 1943, Hermon Brown	124
Notes on Inheritance in Brunsvigia, E. O. Orpet	124
Brunsvigia rosea breeding, E. P. Zimmerman	126
Mutations in amaryllids, L. S. Hannibal	127
Notes on Daylily Breeding, J. Marion Shull	129
Dichogamy and Interspecific Sterility in Alstroemeria, Hamilton P. Traub	131
Agapanthus clone, Arthington Worsley, Hamilton P. Traub	132
4. PHYSIOLOGY OF REPRODUCTION	
Some Problems in the Propagation of the Amaryllids, V. T. Stoutemyer and Albert Close	137
Rapid Multiplication of Lycoris aurea, John V. Watkins	147
5. CULTURE	
The Rice Hybrid Amaryllis, Ernest Braunton	149
Notes on Amaryllis, L. S. Hannibal	151
Notes on Agapanthus Culture, J. N. Giridlian	154
Notes on Tulbaghia violacea, J. N. Giridlian	156
Amaryllids at Rancho Rinconada, 1942-1943, W. M. James	158
The Lesser Bulb Flies, L. S. Hannibal	162
Lycoris squamigera in Kansas, Darrell S. Crawford	164
Spring Star-Flower, Brodiaea uniflora, Darrell S. Crawford	164
Allium Notes, 1943, Sgt. Bernard Harkness	165
Allium and Nothoscordum Notes, F. Cleveland Morgan	166
Brunsvigia Slateriana and other species, L. S. Hannibal	169
Haemanthus albiflos, L. S. Hannibal	169
Hemerocallis in an Iris Garden, Hubert A. Fischer	169
Daylilies in Kansas, Darrell S. Crawford	172
Daylilies in Southern California, C. S. Milliken	174
Daylilies in North Central Texas, Miss W. M. Kell	175
Concerning Injury to Daylilies by Thrips, A. B. Stout	176
Daylily Response to Low Temperature, J. Marion Shull	180
Winter Injury to Daylilies, J. S. Cooley	181
Notes on Bomareas, 1943, W. M. James	184
The Arbuckel Hybrid Amaryllis, George W. Arbuckel	186
Amaryllids on Wreath	187
The Bobolink Daylily, R. W. Wheeler	187
6. THE SOCIETY'S PROGRESS	
The Secretary's Message, Wyndham Hayward	188
The Executive Secretary's Message, L. S. Hannibal	189
The Executive Secretary's Mail Sack, L. S. Hannibal	190
Report of the Trial Collections Committee, W. M. James	192
Officers and Committees	193
Publications of the American Amaryllis Society	195
Data Card for Hemerocallis (Daylily)	197
7. THE BUYERS' GUIDE	
The Buyers' Guide, 1934-1943, L. S. Hannibal	198
Advertisements	199

LIST OF ILLUSTRATIONS

PLATES

Plate 242	Frontispiece portrait—Herbert Medalist, Elizabeth Lawrence	facing page 13
Plate 243	Portrait—J. Marion Shull	31
Plate 244	Herbertia Covers, 1934-1942, incl.	35
Plate 245	Worsleya procera (Duchartre) Traub, gen. nov., group of plants	87
Plate 246	Worsleya procera (Duchartre) Traub, gen. nov., close up, showing character of fruits	88
Plate 247	Yellow Trumpet Narcissus—David Griffith	97
Plate 248	Narcissus clones—Niantic (1944), and Oconee (1939) ...	98
Plate 249	Vegetative Propagation of Hemerocallis	136
Plate 250	The Rice Hybrid Amaryllis	150
Plate 251	Nerine falcata and N. flexuosa	159
Plate 252	Winter Injury to Daylilies	182
Plate 253	Bomarea edulis	185

TEXT FIGURES

Figure 88	Portrait—Franklin B. Mead	26
Figure 89	Brunsvigia rosea; vars. major, minor and Looseriana; Brunsvigia hybrid—Frank Leach	62
Figure 90	Brunsvigia rosea var. major	64
Figure 91	Haemanthus coccineus var. albus, Stanford, sp. nov.	71
Figure 92	Flowers and scape of Festival Daylily	75
Figure 93	Flowers and scape of Elmer A. Claar Daylily	77
Figure 94	Worsleya procera (Duchartre) Traub, gen. nov., capsule and seeds	84
Figure 95	Bobolink Daylily	93
Figure 96	Narcissus ovallaris-cyclamenius hybrid—Chicopee	96
Figure 97	White Trumpet Narcissus—Iana	100
Figure 98	Steps in Narcissus Breeding—Nos. 1 to 4, incl.	109
Figure 99	Steps in Narcissus Breeding—Nos. 5 to 8, incl.	110
Figure 100	Narcissus Breeding—Step No. 10	111
Figure 101	Desiccator for preserving Narcissus pollen	112
Figure 102	Branched pedicels; Agapanthus orientalis and Brunsvigia rosea	127
Figure 103	Dichogamy in Alstroemeria haemantha	131
Figure 104	Agapanthus clone—Arthington Worsley	133
Figure 105	Lycoris aurea; bulb and bulblets	147
Figure 106	Amaryllis solandriflora var. conspicua	152
Figure 107	Ammocharis heterostyla	157
Figure 108	Nerine Masonorum	158
Figure 109	Nerine lucida	161
Figure 110	New Hybrid Amaryllis; Diener's X candida	163
Figure 111	Brunsvigia Slateriana	168
Figure 112	Haemanthus albiflos	170
Figure 113	Thrips injury on Hemerocallis citrina	177
Figure 114	Relative degree of thrips injury on Hemerocallis citrina and Autumn Prince Daylily	179
Figure 115	Bomarea Lehmanii; flowers and fruits	184
Figure 116	Arbuckel Hybrid Amaryllis	186

ERRATA

HERBERTIA, VOL. 9, 1942

- Page 23; 9th. line from bottom, for "of Bostryx" read "or bostryx."
- Page 30; 17th. line from top, for "*Georgio*" read "*Gorgio*."
- Page 53; 2nd. line of text from top, for "EUMARAYLLIDEAE" read "EUAMARYLLIDEAE."
- Page 67; 24th line from top, insert "the" before "*Crinum species*."
- Page 70; species no. 1, lines 11 and 17, under "Notes," the reference to "Bot. Mag. t. 2121" is apparently an error. Major Pam (8-31-43) states that he believes that "Bot. Mag. t. 2121" represents *C. yuccae-florum*. See also the same error under species no. 13 (page 71) and species no. 130 (page 84); and 3rd. text line from bottom, page 67.
- Page 71; species no. 5; for "*C. sumatrana*" read "*C. sumatranum*." species no. 7; for "Bury Hexand. 64" read "Bury Hexand. t. 4." species no. 13. See note by Major Pam about "Bot. Mag. t. 2121" above for species no. 1, page 70.
- Page 72; 5th. line from top, delete "This species is related to *C. ammocharoides*."
- Page 74; species no. 49, add "var. *confertum* Herb. Bot. Mag. t. 2522, and var. *blandum* Roem., Bot. Mag. t. 2531."
- Page 75; species no. 54, add "Bot. Mag. t. 7862."
- Page 77; species no. 75, delete "Plate" before the date "1842."
- Page 78; species no. 84, add "Bot. Mag. t. 7417." species no. 86; for "Lodd. Bot. Cab. Plate 668" read "Lodd. Bot. Cab. t. 688." See also note by Major Pam about "Bot. Mag. t. 2121" above for species no. 1, page 70.
- Page 81; species no. 105, for "Bot. Mag. t. 623" read Bot. Reg. t. 623." species no. 106, for Bot. Reg. Plate 9" read "Bot. Reg. 1844, Plate 9." species no. 109, for "Bot. Mag. Plate 6110" read "Bot. Mag. Plate 6113." species no. 111, add "Red. 347; Bury 42 ?; Bot. Reg. 546 ?; Bot. Mag. 661."
- Page 82; species no. 119, for "*C. Lugardal*" read "*C. Lugardae*."
- Page 83; species no. 126, for "*C. toxicarum*" read "*C. toxicarium*."
- Page 84; species no. 130. See note by Major Pam about "Bot. Mag. t. 2121" above for species no. 1, page 70.
- Page 88; 24th. line from top, for "of any later work" read "or any later work."
- Page 93; for "Genus STERBERGIA" read "Genus STERNBERGIA."
- Page 99; for "*Calostemma purpurea*" where it appears read "*Calostemma purpureum*."
- Page 122; 20th. line; for "*Tahiti Belle* (1924)" read "*Tahiti Belle* (1942)."
- Page 201; Figure 85, legend should read "*Crinodonna Howardii*; right, entire plant; left, close up of flower scape."
- Page 235; 16th. line, beginning with 3rd. word, read "Thirty-five illustrations—17 plates and 18 figures—."

NOTE TO MEMBERS AND LIBRARIANS

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Correspondence regarding articles and illustrations for HERBERTIA, the Year Book of the American Amaryllis Society, is cordially invited.

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When taking photographs of amaryllids, an effort should be made to include the whole plant—*stem*, if any, *leaves*, *scape* and *flowers*. Separate views of the *bulb* and *roots* are also valuable in some cases. These remarks do not apply to cut-flowers.

*Dedicated to
Elizabeth Lawrence
in appreciation of
her outstanding contributions
to our knowledge
of the use of amaryllids
in our gardens.*



Herbert Medalist — Elizabeth Lawrence

ELIZABETH LAWRENCE

AN AUTOBIOGRAPHY¹

When I was a little girl my mother took great pains to interest me in learning to know the birds and wild flowers and in planting a garden. I thought that roots and bulbs and seeds were as wonderful as flowers, and the Latin names on seed packages as full of enchantment as the counting-out rhymes that children chant in the spring. I remember the first time I planted seeds. My mother asked me if I knew the Parable of the Sower. I said I did not, and she took me into the house and read it to me. Once the relation between poetry and the soil is established in the mind, all growing things are endowed with more than material beauty.

When I was twelve we came to live in Raleigh, in a house with an already established garden. It was fall when we came, and there was not much in bloom—only some old fashioned roses and chrysanthemums that the frost had not caught. But the first spring was like living my favorite book, *The Secret Garden*. Every day the leaves and flower buds of some plant that we did not know was there, would break through the cold earth. There were snowdrops under the hedge, and crocuses in the grass, and the garden pattern was picked out in daffodils. And under the eaves of the summerhouse a single fat white hyacinth bloomed. No other spring has ever been so beautiful, except the spring of the year I came home from college. That first spring in the South after four years in New York led me to choose gardening as a profession.

In the fall a course in Landscape Architecture (the first in the South) was started at the North Carolina State College, and I started with it, the only girl in the class. One morning a visitor came into the drafting room and stopped at my drawing table in passing, and said, "I know another Miss Lawrence who is a landscape architect. She knows as much about plant material as any one in the profession." I felt as if the mantle of the other Miss Lawrence had been thrown across my shoulders. I had never heard of her before, and I have never heard of her since, but because of her I felt a compulsion to study plants. I soon learned, however, that a knowledge of plant material for the South could not be got in the library, most of the literature of horticulture being for a different climate, and that I would have to grow the plants in my garden, and learn about them for myself.

My ancestors were people who lived to be very old, and it encourages me to think that I may have inherited their longevity, and that I have many years ahead to see bloom in my garden flowers that I have never seen in bloom before, and have only just heard of.

¹ Born, Marietta, Georgia, May 27, 1904; B. A., Barnard College, 1926; B. S., North Carolina State College, 1930.

AMARYLLIDS IN A SOUTHERN GARDEN

ELIZABETH LAWRENCE, *Raleigh, North Carolina*

It has been a little more than ten years since I began to collect amaryllids, and to grow them in the garden—not that I thought, ten years ago, of collecting amaryllids. I thought only of seeing in bloom flowers new and strange. My mother had discovered Gordon Ainsley, and she and I would go through his little leaflet, especially the section headed “Miscellaneous Bulbs, Tubers and Rare Plants,” and make a painful choice of the ones we most wanted to try. Before many seasons had passed it became apparent that, on the whole, the bulbs most likely to grow and bloom for us belonged to the amaryllis family. It was then that Billy Hunt told me about the Amaryllis Society, and I pored over HERBERTIA, and began to acquire as many members of the *Amaryllidaceae* as I could. Not having a greenhouse, I limited myself to those which would grow out of doors, and I tried to be systematic about keeping a record of them. In this 10th. Anniversary Edition of HERBERTIA it seems appropriate to review ten years of experiment in a North Carolina garden.

Since the provenance of many of the most beautiful amaryllids is tropical or subtropical, growing them out of doors this far north is largely experimental, and many that survive do not bloom when they are grown so near their northern limit of hardiness. Here, during an average winter the lowest temperature is eight or ten degrees above zero. The weather bureau in Raleigh has recorded zero once in this century. That was in 1917.

I sometimes read that amaryllids which have failed with me grow where the temperatures are much lower than these. Perhaps some factor other than temperature is involved, or perhaps the amaryllids were given more protection. Mine go unmulched, and I cannot bear to plant them very deep—I always feel that they will never find their way out of the dark earth into the spring sunlight. But it may be that with deep planting and a generous coat of manure, some of those that have died would have lived, and some of those that merely existed would have bloomed.

Crinums and Crinodonna. The first record I have of an order from Mr. Ainsley (spring 1932) is for *Brunsvigia rosea* (syn. *Callicore rosea*; *Amaryllis belladonna* Ait. et Herb. non Linn.), *Chlidanthus fragrans*, *Lycoris squamigera*, *Sternbergia lutea*, and the *Crinum* species *Kirkii*, *Powellii* (both the white and the pink forms), *erubescens*, *Bulbispermum* (syn. *C. longifolium*), and *Moorei*. The brunsvigia and the chlidanthus failed to bloom, though they sent up leaves each spring for a number of years, and the lycoris and sternbergia did not bloom for several seasons. But the crinums were an immediate success, and I wanted to grow as many sorts as I could.

The species that have proved garden worthy in North Carolina are *Crinum americanum*, *C. erubescens*, *C. Kirkii*, *C. Kunthianum*, *C. bulbispermum* (syn. *C. longifolium*), and *C. Moorei*. *C. americanum* grew for five years before blooming, but it has now bloomed for two

seasons. The season is late August and early September when its narrow-petalled, pure white flowers are particularly striking in the ragged end-of-the-summer borders. In these parts I think this may not be everyone's crinum for it seems choice as to situation, growing well in heavy clay in a low bed that gets the morning sun, and not surviving when transplanted to a different place. But it increases rapidly when it is once established, and I can even imagine that it might increase too much. One could never have enough of the delightful flowers, but the foliage might take up more space than one wanted to give it. A large clump has not yet produced more than two blooms a season. I was interested to hear from Mrs. Henry that she had bloomed this crinum in Pennsylvania, but that it had died the following winter. I imagine from its behavior here that it is not hardy very far north of us.

The species that have not survived our winters are *C. amabile* and *C. zeylanicum* from the Royal Palm nurseries; and *C. giganteum*, the "Christopher Lily" marked "species near *giganteum*," *C. scabrum*, a species from Burma, and one labelled "species near *amabile*," from Mr. Hayward. The species from Burma was always sickly, and did not bloom, and lived only a few months. *C. scabrum* bloomed in June and again in September, the fall bloom being especially large and handsome and long lasting. The second spring it failed to put in an appearance. This is not such a loss, as there are many good crinums of the milk-and-wine type, but I was distressed when the rare and lovely "species near *amabile*" proved tender. Planted late in March with *C. scabrum*, it did not bloom until mid-September, when the dark reddish purple buds opened into flowers striped amaranth purple and pure white. These flowers were comparatively small, and there were seven to an umbel. The second day all were open and all were fresh. On the borderline of hardiness is a very small crinum sent to me by Mr. Hayward as *C. giganteum hybridum* which has survived but has not bloomed.

Only one of the hybrids that I have tried has failed to be hardy. This is the most beautiful of all, the *Empress of India*. The first time I had no better sense than to set out at once the magnificent bulb (sixteen inches in circumference) that Mr. Hayward sent me in the fall. The second time I asked his advice, and kept the bulb in sand in the cellar until the end of March. After sunset on the fourth of September, the first long narrow bud began to open. We sat watching as if it were a night-blooming cereus. I do not think Balboa could have been more breathless when he first looked upon the Pacific, than the Lawrences when they first saw the fully expanded flowers (twelve inches across) of the *Empress of India*, milk-white, wine-striped, and heavily scented. This crinum blooms only at night. The flowers wilt as soon as the sun touches them in the morning, and do not revive, as some crinums do, with the cool of the next evening. Both the bulb that flowered and the one planted in the fall died before spring. I do not think it worth while to try the *Empress of India* again.

I think I might have better luck another time with the rose-colored form of *C. Powellii*, which lived through one or more winters, and bloomed once. Probably it will not prove as robust and free-flowering as the pink-flowered *Cecil Houdyshel* or the dazzling white *Powellii*.

White Queen, *Ellen Bosanquet*, and *Virginia Lee* are satisfactory for the garden though I have not had these long enough for them to become thoroughly established. The dark purple buds of *Ellen Bosanquet* open in the afternoon into flowers of the brilliant deep rose that Ridgway calls spinel red. They are shaped like the flowers of *C. Moorei*, and have the same vanilla fragrance. The plant is very large. *Virginia Lee* is a small crinum with flowers like those of *C. Moorei*, but paler.

Some of the most delightful crinums are those found in gardens. The late summer and fall blooming Milk-and-Wine Lily of the dooryards of eastern North Carolina is one of the best of all crinums. From a garden in Atlanta I brought home a very delicate and lovely one, pure white with pink filaments and a delicious and characteristic fragrance—something of vanilla and something of lemon. There are six flowers to the slender short scape. They open at night, and last through the next day. This one multiplies very fast, and blooms at intervals from the end of May to the end of October. From my great-aunt Rosalie's garden on Saint Simon's Island I brought the crinum—common in South Georgia—with fringe-like bunches of small white flowers on tall thick scapes, but this one did not live.

Crinodonna Howardii (*Amarcrinum Howardii*) seems to be as satisfactory in the garden as the crinums, and has come through two winters during which the lowest temperature was ten degrees above zero. It blooms in August and September. The delicate pink flowers are much like those of its parent *Brunsvigia rosea* (syn. *Callicore rosea*).

The season for crinums is a very long one. From April to October there are few days when no crinum is in bloom in my garden. *C. bulbispermum* (syn. *C. longifolium*) often begins to bloom in April, and our Milk-and-Wine Lily sometimes sends up a scape or two in November. The *White Queen* follows *C. bulbispermum* and *C. Kirkii*. *C. Kunthianum* and the white *Powellii* bloom in June and July. The last three are the most profuse bloomers, with twenty or more blooms to a clump, but the scapes come all at once. However each has repeated, on occasion, in the late summer or fall. *Cecil Houdyshel* sends up two or three scapes each summer month, and the Milk-and-Wine Lily and *C. americanum* begin to bloom before its flowering is over.

Lycoris and Nerine. Except for the Hurricane Lily, the species of *Lycoris* that I have grown have lived and bloomed, and bloomed regularly and freely. The only difficulty is that so few species are available. I long for *L. sanguinea*, *L. Sprengeri* (which Colonel Grey says should be about as hardy as *L. squamigera*), and the white form of *L. radiata*. Colonel Grey describes *L. aurea* as perhaps the least hardy member of the genus. With me the bulbs are hardy, but the foliage is made in the fall and is injured by the cold. The bulbs live on indefinitely, but there is no bloom.

Lycoris radiata is a dooryard flower in the eastern part of North Carolina, and though it is not generally considered hardy in the mountains, I had a report last fall of bloom in Asheville. Long ago I sent bulbs to Mrs. Wilson in Anne Arundel County, Maryland, and she wrote me that they died. Years later she went out one day in September and found them in bloom.

Bulbs which I had from Mr. Hayward as *L. squamigera* var. *purpurea*, from Mr. Houdyshel as *L. incarnata*, and from Dreer (I think it was Dreer) years ago as *Lycoris squamigera* itself, bloom well most seasons, and give increase. The flowers, to me, are the most delicate and lovely of all the amaryllids. They do not resemble the description which Colonel Grey quotes from the *Gartenwalt* of 1906, of "purple and carmine segments to Prussian-Blue at the tips," but are white with a wine-colored keel. The leaves appear at the end of January, a week later than those of the typical *L. squamigera*. When they come up they are edged with bright red.

Though I have tried a number of species over a period of years, no *Nerine* has ever bloomed for me. Once I thought one was going to, when a bulb sent from California as *Nerine undulata* produced a scape. As the days passed the opening flowers looked suspiciously like *Lycoris radiata*, and when in bloom proved to be a form of it.

That the nerines do not bloom here saddens but does not surprise me. In the first volume of HERBERTIA, the Honorable Henry McLaren writes of growing them out of doors in England, "They want to grow in winter and rest in summer, and the climate forbids this." Our climate forbids it too, and I have found it forbidding to other amaryllids from South Africa, and to South African plants in general. In a well-drained position in full sun, *N. Bowdeni*, *N. coruscans*, and *N. rosea crispa* (the last two, varieties of *N. sarniensis* according to Colonel Grey) have persisted for a number of years without bloom. Mr. Hayward sent me a fine bulb of *N. curvifolia* var. *Fothergilli* which, after a late summer planting, produced leaves in November but has made no sign of life since. *N. filifolia* refuses to grow too, though I have tried it more than once, and in different soils and exposures.

Brunsvigia rosea. Another Cape bulb that wants to grow in the winter and rest in the summer, and so does not accomodate itself to North Carolina, is the delightful pink lily that we used to call *Amaryllis belladonna* (Ait. et Herb. non Linn.) more recently *Callicore rosea*, but is now known as *Brunsvigia rosea*. It has bloomed in the garden only once though it has been tried a number of times. The bloom appeared in August from a bulb that had been planted in November. I have also tried the varieties *major* and *minor* and *rosea* and *Parkeri*. All persist. None bloom.

Amaryllis. The Barbados Lily, which we now know to be *Amaryllis belladonna* Linn., but which I planted as *Hippeastrum equestre*, fares no better. I think the bulbs Mr. Hayward sent me have finally disappeared, though they survived several winters. *Amaryllis rutilum* var. *fulgidum* behaved in the same way. And *A. Johnsonii*, though it grew and flowered in old gardens in these parts, has always been a shy bloomer with me, if it bloomed at all.

One amaryllis which does flourish here is the little Ox-blood Lily, *A. advena*. It multiplies steadily and blooms profusely. The number of sharp-pointed buds that push up out of the ground from late August to late October is unbelievable. This lily seems to grow in any soil or situation, but it responds especially to barnyard manure.

Hymenocallis and Pancratium. There are reports of *Hymenocallis* hardy as far north as Pennsylvania, and they should certainly be grown in the Middle South. The difficulty is in the confusion of the names. Even when you find one that grows and blooms, you cannot be sure what it is.

Two species are native to North Carolina. I do not know how the small, spring-blooming *H. rotata* of the coastal plain behaves in cultivation. I saw the flower at a country flower show early in May. A farmer's wife brought it in, either from her garden or from the woods. The summer-blooming *H. occidentalis*, from the mountains, grows in a damp part of the garden, and blooms at the end of August.

H. galvestonensis, the Gulf Coast Spider-Lily, is reported as failing to flower in cultivation, and I was about to confirm this report when I went out in the garden to cut iris, and found the long bud of the Spider-Lily almost ready to open. It opened on the sixth day of May, which is the earliest bloom on my records for hymenocallis. The wide flat cup and the narrow petals of the flower are very similar to those of *H. occidentalis*. The bulb had come from Mr. Houdyshel three years ago, and had been planted in full sun in poor but well-drained soil.

Spider-Lilies like crinums should be sought in gardens. Recently I found two delightful late summer hymenocallis in cultivation. Both were similar in general appearance to our summer-flowering native, *H. occidentalis*, but there were differences in length of tube, segments and cup. Last September Mrs. McMillan brought the flowers and leaves of one of these from an old garden in the southern part of the state. The other came from Atlanta and bloomed with me in July.

My sister came across another summer-flowering hymenocallis in a garden in Alexandria, Louisiana. "Mrs. Peters has the most beautiful white flower that looks as if it belongs to that family you talk about so much," she wrote in August. When she came home this year in June she brought me two of the bulbs. One of them bloomed after dark on July the sixteenth, and it seemed to me as I looked at it in the moon light, more beautiful than any hymenocallis I had seen. The perfectly proportioned flowers seem larger than those of any other native species, though they are not very much so by measurement. The delicately fluted cup is an inch and a quarter deep, the drooping segments, incurved and revolute at the tips, are three and a half inches long, and the greenish tube is three inches long. There are five pleasantly but not heavily scented flowers to an umbel. They are of good substance and withstand the heat of the day better than most. One leaf came up with the stout glaucous scape.

When I wrote Mrs. Dormon, who lives in Shreveport, about Mrs. Peters' Spider-Lily, she said that she thought it must be the same as an unidentified native species she had in her garden, and which she designates as "fall-blooming" to distinguish it from another native that blooms in the spring. I put two of the bulbs that she sent me in the ground at once, and wintered a third in a pot. One of those left outside put up one weak leaf late in the spring, but it soon died away. However, Mrs. Henry says she has found this Spider-Lily to be hardy in Pennsylvania. "I have grown *Hymenocallis* here for some years and

enjoy them immensely," she wrote Mrs. Dormon. "I have them growing on a southern slope—in fact, the warmest spot on my place—and give them no protection whatever in winter. You sent me two kinds several years ago—one marked 'spring blooming' and one marked 'fall blooming.' Only one of these has bloomed so far, and it blooms in August. The leaves are a glaucous bluish. It is a tall vigorous species and very beautiful."

Some of the exotic *Hymenocallis* species are hardy in North Carolina. One sent to me labelled "*Pancratium maritimum*" bloomed several successive years in late May or early June, occasionally repeating. I moved it to a damp shady place and it has not bloomed again, though it always makes a good clump of dark green foliage. The leaves are narrow and strap-shaped, and come before the flowers. The flowers are four to an umbel with very narrow segments, shallow cups, and very long green tubes. This *Hymenocallis* is similar to a narrow-leaved species which came from Mr. Houdyshel as a "Dwarf Spider Lily." It bloomed once in June, sending up a single scape, and did not bloom again for four years though it increased and produced shining foliage each spring. Then this year, the first of July, it suddenly bloomed again. Their erratic blooming habits are the only drawback I can discover to the use of spider-lilies in the garden.

Mr. Houdyshel's "Tropical Spider Lily" lived through three winters and bloomed two summers (in June and July), and then failed to come through when the thermometer dropped to six degrees above zero during the January that the weather bureau said was the coldest on record. I am trying it again, for the flowers are the most beautiful of any species that I have grown. There are twelve to an umbel, and they are very large and fragrant. The beautiful wide dark green leaves are like those of the ismene, and like them come up late in the spring and last until heavy frost. They are extremely decorative.

Ismene calathina is hardy out of doors in North Carolina, and blooms, but not well, for several years if left in the ground. However, it is not really satisfactory unless the bulbs are dug each year. The hybrid, *Sulphur Queen*, is a better garden subject because the bulbs do not split up. I have wanted very much to try out the newer *Ismene* hybrids but they have been expensive. Now that the prices have come down, I have got *Advance*. I put it in the most protected spot in the garden, at the foot of a low wall facing south. If it succeeds, I shall try the others.

The bulb in the trade as *Hymenocallis caribaea* has not proved hardy here after many trials, though it is said to be hardy to North Carolina and perhaps even farther north. It may be that deeper planting would have got results.

In North Carolina the sea-daffodil *Pancratium maritimum* survives in well-drained soil, but I have had bloom only once, though I have planted it many times. The bloom was from a spring-planted bulb, but even with spring planting it is not certain to flower. Since it is so very beautiful and the bulbs cost so little, I am still trying to prove it a satisfactory garden subject.

Zephyranthes, *Cooperia*, *Habranthus*, and *Cyrtanthus*. In this part of the country, everyone is familiar from childhood with the milk-white Atamasco Lilies that bloom in April in low-lying meadows. Although this is the only species native to North Carolina, a number of zephyranthes flourish in my garden. The most prolific and floriferous of these are the handsome pink *Z. grandiflora*, and the little white-flowered *Z. candida*. *Z. citrina* (from the Amaryllis Society) usually blooms once a month from July to October, but the bulbs do not increase. This is the best yellow-flowered species. *Z. pulchella* (also from the Society) is similar to *Z. citrina*, but not so adaptable to garden conditions. It bloomed only once, early in September. The other yellow-flowered Texas species, *Z. longifolia* (from Mr. Ainsley), lived for several years but never bloomed. Afterward I learned from Mr. Cory that it will bloom only in a highly calcareous soil, but I could not find it listed again. I doubt that the gardener would find the flower very different from that of *Habranthus texanus*, but once you have set your heart on seeing a little bulb in bloom it haunts you until you have been able to secure it, and at least proved that it will not bloom for you.

Z. Simpsonii, another of the species that the Society sent to members, is similar to *Z. Treatiae*, but neither as handsome nor as lasting. *Z. Treatiae*, said to be difficult of culture, is well established with me. However, it does not increase.

The Zephyr Lilies that have not lived through a winter, or bloomed even once, are *Z. bifolia* and *Z. macrosyphon*. *Z. tubispatha* came up for one or two springs before disappearing for good. *Z. rosea*, which I have planted many times and which is my favorite, sometimes lives through the winter, but it does not persist many seasons. It bloomed once at the end of the summer, and the little deep rose-colored lilies are the most exquisite little flowers that ever appeared in a garden. I am still trying to find the sheltered place and the proper soil to allow it to become established.

The hybrid, *Z. Ajax*, is not very robust here. I have had it longer than I can remember, but it increases little, and rarely produces more than one of its delicate pale flowers during a season. It blooms in the late summer or fall and is capricious, coming any time from August to October.

Of the three species of *Habranthus* available, *H. robustus* and *H. texanus* have long bloomed in my garden, and *H. brachyandrus* bloomed there last summer for the first time. I have read that *H. texanus* is difficult in culture, but it is most amenable with me. It blooms freely at intervals from early June to late September, and increases well. The flowers of *H. brachyandrus* are larger than those of any habranthus or zephyranthes that I have seen, and of such tropical beauty that I could not believe they would endure any amount of cold. But the new leaves began to put out very early in the spring after a very trying winter. Whether it will bloom the second season is another question.

Cooperias, like zephyranthes, flower at rainy intervals of spring and summer. Only *Z. pedunculata* blooms. *Z. Drummondii* has never been anything but a few slender rust-like leaves. According to descriptions

this is small loss, but you would always like to see for yourself. I keep wondering why it does not bloom, and what I could do to make it bloom.

Cyrtanthus is a genus that does not thrive in these parts, and I am not surprised, for the species come from South Africa. The bulbs seem to be fairly hardy, but they do not become established well enough to bloom with any satisfaction. *C. lutescens* (*C. ochroleucus*) was planted in April and bloomed in May, and then lingered on for several seasons without blooming at all. *C. parviflorus*, planted in October, skipped a season but bloomed the second spring. That was the last of *C. parviflorus*, and *C. Mackenii* and *C. angustifolius* never bloomed. These were all planted in a low place in clay soil with a mulch of cow manure. I put them there because that is the place where the Zephyr Lilies thrive, but it may be that in this climate they need more drainage.

Snowdrops and Snowflakes. I started growing Snowdrops on the theory that the species from Asia Minor would be better adapted than those from Europe to conditions in the South. But of those that I have grown, *Galanthus nivalis* var. *Schorlokii* has been by far the most satisfactory over a period of years. *G. Elwesii* persists, but does not bloom as well and does not bloom any earlier. *G. byzantinus* bloomed in mid-winter, but that effort was too much for it, I suppose, as it was never seen again. *G. latifolius* did nothing.

As to Snowflakes, as near as I can tell all of those in the trade as *Leucojum aestivum* are *L. aestivum*, and all of those in the trade as *L. vernum* are *L. aestivum*. I have never got *L. vernum* under its own name or any other, if it is, as described, a solitary flower. If this species is to be had in this country, I would like to know about it. Being particularly eager for fall flowers I also tried *L. autumnale*. So far it has not bloomed in the fall, or at any other time. In general I have not found bulbs from the Mediterranean satisfactory in North Carolina.

The Allieae. In this tribe I have made attempts at growing many brodiaeas, many more alliums, *Milla biflora*, *Pharium elegans* (syn. *Bessera elegans*), and *Leucocoryne ixioides*, the last three without success.

Mr. James doubts (HERBERTIA, 1936) whether the two Mexican bulbs will stand many degrees of frost, and thinks they should be dug, except in the milder climates. I suppose the climates in which they need not be dug are milder than this, for here they were not satisfactory even as summer bulbs. The milla was planted twice, once in the fall and again in the spring. The spring-planted bulb bloomed, but poorly. The pharium was planted in spring, but it did not bloom. Neither the milla nor the pharium lived through a winter, but I am trying them again this year in a more protected place.

Leucocoryne ixioides var. *odorata* fared no better, which was only to be expected as I set the bulb out in winter. I mean to give it another trial, though that is scarcely worth while for it is said to require the same culture as freesias, and they are too tender for us.

The alliums are too numerous to take up in detail. Most of them do well (some only too well), but there are a few that I have not been able to grow. The beautiful azure *Allium caeruleum* did not persist.

The somewhat tender *A. neapolitanum* seems to be hardy, but blooms so early that the flower buds are nearly always caught by the cold, and even when they are not caught they are inferior to those of other species. *A. karataviense* lives, but that is all. *A. Rosenbachianum* did nothing. *A. validum* was tried in vain a number of times. I cannot get enough moisture for it. *A. Moly*, which is the most attractive one that I have seen, with large bunches of daffodil-yellow flowers, refuses to grow at all. This I cannot understand, and I mean to keep trying.

Brodiaeas in North Carolina are not what they are in the West (Mrs. Rowntree says this is because I do not cultivate deep enough) but they make charming and fragile bloom in the shady rock garden. *B. ixioides*, *B. coccinea* (*Brevoortia Ida-Maia*) and the white flowered *B. Eastwoodii* did not persist, but most of the species do. The blue-dicks and a run-of-the-mine hybrid have bloomed in one place for more than ten years. The pale lavender-flowered *B. Bridgesii* is one of the prettiest, though the precocious flowers are often nipped by frost. *B. lactea* and *B. coronaria*, the harvest brodiaea, are the dependable sorts.

Other Amaryllids and Alstroemerias. After many years of trial I have given up hope of establishing alstroemerias, especially after discovering that they are susceptible to the bacterial wilt that is the curse of Southern gardens. I have had *A. aurantiaca*, and its variety *lutea*, and *A. chilensis*. Only *A. aurantiaca* bloomed. It bloomed in late June after having been planted in October, and when all of the gorgeous flowers were open, the whole plant turned yellow and died.

Ixiolirion tataricum, the one time I bloomed it, was a poor thing. Perhaps it should have been in a richer soil, or perhaps the bulbs were poor to begin with. At any rate I was not sorry when they disappeared, but I should like to try again with bulbs from another source.

I have had the delicate lily, *Chlidanthus fragrans*, many times and from many sources, and have planted it in various parts of the garden. Leaves appear season after season, but no blooms. It is said to be a satisfactory garden plant when taken up and dried off, but with me even large spring-planted bulbs fail to flower.

Sternbergia lutea has been in Southern gardens since the days of the Colonists. In mine, for some reason, it is chary of bloom, though I have had it for long years and the clumps are well established. Late in August or early in September there are always a few of the buttercup-yellow flowers, but never many. I cannot but think that the Amaryllis Family as a whole is somewhat temperamental.

Agapanthus africanus var. *Mooreanus* grew in a low border for a number of years and bloomed once, at the end of June, but not before it was well established. Later it disappeared. The flowers were a dull blue, and I hope that when I try it again I shall get a better form. *A. orientalis* (*A. umbellatus*) has not bloomed, but has come back after its third winter. It is said to bloom out of doors in Raleigh. I have a root from Mr. Hayward, and one from a garden in California.

Sprekelia formosissima is perfectly hardy with us, but capricious as to bloom. At least it is capricious with me. But a friend who saw it one of the two times it did flower said, "Oh, those little red lilies

used to bloom every spring in our old garden in Petersburg." I doubt whether she knew much about flowers, but I do not think that anyone could mistake the Jacobean-Lily.

Vallota speciosa (in the trade as *V. purpurea*) was planted one September at the foot of a retaining wall, and was never seen again. I should have planted it in the spring, and on top of the wall, and mixed sand with the heavy soil. If I can get hold of it again (it took me a number of years to procure the first bulb), I shall treat it better. Colonel Grey says that it is hardy with a little protection in the south and west of Great Britain, so long as it is not water-logged in winter.

Daffodils (*Narcissus*) and daylilies (*Hemerocallis*) flourish in the South, but these, of course, flourish everywhere. I would like to try more of the tender daffodils particularly of the tazetta and triandrus groups. Of daylilies I have had mostly the standard sorts, but I have been interested in several of Mr. Hayward's, particularly one with a small dark red flower.

Amaryllids in England and the United States. It is interesting to compare one's own results in growing amaryllids with those of gardeners in other places. I noted particularly Major Pam's remarks in HERBERTIA (1940, p. 41) on the hardiness of amaryllids in his English garden where the winters are more severe than those in Piedmont, North Carolina: "The past winter has been very cold indeed for this country, and record frosts have been recorded in many parts. In my gardens the lowest temperature was 2 degrees below zero Fahrenheit in the open, and it hovered around zero for several weeks. Yet the amaryllids grown in the open did not suffer, and I have had but few losses. It seems as if established plants can stand very much more cold than we had expected, and I think it may be worth while for some lovers of this family who live in the more northern States of the U. S. A. to try to grow in their gardens some species which were reputed to be tender. Among the plants which not only survived here but have flowered this year as freely as ever are,—*Amaryllis* (syn. *Hippeastrum*) *pratensis*, *Sprekelia formosissima*; *Amaryllis* (syn. *Hippeastrum*) *Ackermanni*; *Crinum Powellii*, *C. Moorei* and *C. longifolium*; *Alstroemeria Lignu*, *A. aurantiaca*, *A. chilensis*; *Pancratium illyricum*, in addition of course to all the species generally considered hardy. The following are untouched by frost and will certainly flower freely in their proper season: *Callicore rosea* (syn. *Amaryllis belladonna*), *Nerine Bowdeni major*, *Hymenocallis festalis* (Mr. Worsley's hybrid), *Lycoris* spp., and several other alstroemerias such as *A. braziliensis*."

HERBERT MEDAL AWARDS, 1937-1943

HAMILTON P. TRAUB

The William Herbert Medal, founded in memory of Dean William Herbert, and to commemorate the 100th. Anniversary of the publication of Herbert's Amaryllidaceae, 1837, was initiated in 1937 to be awarded to persons for outstanding achievement within the field of the American Amaryllis Society. The first award was fittingly made to the late

TABLE 1
THE HERBERT MEDAL AWARDS, 1937-1943, INCLUSIVE

Year of award	Recipient	Address	Outstanding Achievements
	* Henry Nehrling, 1853-1929	(Florida)	Pioneer breeder of hybrid Amaryllis and crinums in America.
	* Theodore L. Mead, 1852-1936	(Florida)	Origination of Mead strain of hybrid Amaryllis .
1937	Arthington Worsley	Isle of Wight, England	Introduction of amaryllid species; cross pollination of amaryllids.
1938	Ernst H. Krelage	Haarlem, Holland	Breeding of Narcissi and other amaryllids.
	Cecil Houdyshel	La Verne, California	Introduction of amaryllids, and breeding of crinums.
	Major Albert Pam	Broxbourne, England	Introduction of amaryllid species.
	Pierre S. du Pont	Wilmington, Delaware	Origination of pink strain of hybrid Amaryllis .
	Jan de Graaff	Sandy, Oregon	Narcissus breeding.
1939	Dr. John Hutchinson	Kew, England	Phylogeny of Amaryllida- ceae.
	Dr. A. B. Stout	New York City	Daylily Breeding.
	Sydney Percy Lancaster	Alipur, India	Origination of Cooperanthus and other hybrid Amaryllids .
	Carl Purdy	Ukiah, California	Introduction and culture of North American Allieae.
	Fred Howard	Montebello, California	Origination of Howard strain of hybrid Amaryllis and Crinodonna Howardii .
1940	Herbert William Pugsley	Allen's Green, England	Taxonomy of Narcissus .
1941	Wilfred MacDonald James	Ojai, California	Nerine breeding; introduc- tion and culture of amaryl- lids.
1942	Prof. Dr. Abilio Fernandes	Coimbra, Portugal	Karyo-cytology of Narcissus .
1943	Miss Elizabeth Lawrence	Raleigh, North Carolina	Outstanding work on use of amaryllids in gardens.

* Medal awarded posthumously in 1943.

Arthington Worsley in 1937 in appreciation of his valuable contribu-
tions to the advancement of the Amaryllids. These were summarized in

his autobiography that appeared in HERBERTIA 1936 (Vol. 4, pp. 10-19). The Medal was illustrated in HERBERTIA 1938 (Vol. 5, Plate 98, p. 65).

The amaryllids had been neglected for so long that a number of awards were long overdue. To bring the awards up-to-date the Medal was presented to more than one person in 1938 and 1939.

The Class of 1938 included Ernst H. Krelage, for breeding Narcissi and other Amaryllids; Cecil Houdyshel, for introduction of Amaryllids and breeding Crinums; Major Albert Pam, for the introduction of Amaryllid species; Pierre S. du Pont, for the origination of a pink strain of hybrid *Amaryllis*; and Jan de Graaff, for *Narcissus* breeding.

The Class of 1939 included Dr. John Hutchinson, for original contributions to the phylogeny of the Amaryllids; Dr. A. B. Stout, for daylily breeding; Sydney Percy Lancaster, for the origination of *Cooper-anthes* and other hybrid Amaryllids; Carl Purdy, for the introduction and culture of North American Allieae, and Fred Howard, for the origination of the Howard Strain of hybrid *Amaryllis* and *Crinadonna Howardii*.

In 1940 the award went to Herbert William Pugsley for his thorough work on the taxonomy of *Narcissus* species. In 1941, the award was made to Wilfred MacDonald James for *Nerine* breeding and the introduction and culture of Amaryllids. In 1942, Dr. Abilio Fernandes of the University of Coimbra, Portugal, received the award for his outstanding contributions to the karyo-taxonomy of *Narcissus*. The current (1943) award of the medal has been made to Miss Elizabeth Lawrence. Her outstanding contributions on the use of Amaryllids in our gardens are summarized in that inspiring book, *A Southern Garden*, (University of North Carolina Press, 1942). The subject has been brought up-to-date in Miss Lawrence's article in this issue of HERBERTIA.

The two outstanding American pioneers in the field of the Society had passed to their reward before the Herbert Medal was founded. As fitting memorials to these pioneers, the Herbert Medal was awarded posthumously in 1943 to Henry Nehrling, 1853-1929, to whom the first Volume of HERBERTIA (1934) was dedicated; and to Theodore L. Mead, 1852-1936, whose autobiography appeared in the second Volume of HERBERTIA (1935).

FRANKLIN B. MEAD, 1875-1933

Through Mrs. Franklin B. Mead, Sr., of Fort Wayne, Indiana, we have secured the following biographical details about the late Franklin B. Mead, and also the photograph portrait, taken at the age of fifty years, and which is reproduced in Figure 88. Mr. Mead was the originator of the *Hyperion* Daylily, which represents a landmark in the breeding of this class of plants. *Hyperion* has been used to a large extent by many daylily breeders including Mr. Amos Perry in England.

“Franklin B. Mead was born August 27, 1875 at Greenfield, Ohio. He was educated at the University of Cincinnati and the University of Michigan. He entered the life insurance business which was his life's vocation.



Fig. 88. *Franklin B. Mead*

“Mr. Mead died very suddenly of an embolism in the prime of his life in 1933. His interests were many and varied and he lived a full life. His main hobby was concerned with iris breeding, and we called our place “Iris Crest.” However, he was very proud of his daylily origination, *Hyperion*. In 1931 he received an Award of Merit for it from the Royal Horticultural Society after trial at Wisley. It was introduced to the trade by Wayside Gardens in 1925.”

IN MEMORIAM—ARTHINGTON WORSLEY, 1861-1943

Arthington Worsley died at his home in the Isle of Wight on January 13th, 1943, and was laid to rest on January 18th in the village churchyard at Godshill, where many of his ancestors are buried. He had been in failing health for two years and was in his 82nd year when he died.

An autobiography was published in *HERBERTIA*, Volume 3, giving the story of Worsley's life and career—there is little that can usefully be added to this.

Arthington Worsley was more than a keen gardener—he was deeply interested in the scientific side of horticulture and was recognised as an expert on the *Amaryllidaceae*.

His death will be deplored by all his friends—he had a charming personality and had travelled in many parts of the world; he had read extensively and was a most pleasant companion, talking with knowledge on a great variety of subjects. The sympathy of all the members of the American Amaryllis Society will go to his widow and to his son in their great loss.—*Albert Pam*

IN MEMORIAM—GORDON AINSLEY, 1896-1942

We deeply regret to report the passing of Gordon Ainsley on September 12, 1942 at his home in the Los Gatos hills, near San Jose, California.

Mr. Ainsley was born August 2, 1896 in Campbell, California where his father owned one of the first independent fruit canneries in the Santa Clara Valley. He graduated from Campbell Grammar School with high honors, and then went to Montezuma School at Los Gatos where he endeared himself to Masters and boys alike, regardless of a heavy physical handicap which he carried through life without complaint. In 1923 he married Miss Alice Clark.

He was always a great lover of flowers even from childhood, and his garden, which later became his nursery, was located at the old family home at Campbell to the west of San Jose. We recall often seeing him working amongst the plants he cherished, or talking with a garden friend. His business, established in 1925, was an outgrowth of the hobby of bulb collecting, and in its day it was indeed remarkable in scope due to the number of rarities one could find there, especially among the amaryllids. Much of his material came from Barr, Sutton, and van Waveren, but many items came direct from the wilds of South America, South Africa, India and other foreign countries.

In his catalog of 1932, which marks the high point in his bulb business, we find over 65 Amaryllids listed among a thousand or so items. This included *Alstroemeria*, *Nerine*, *Cyrtanthus*, *Hymenocallis*, *Crinum*, *Zephyranthes* and other genera, but he also had many unlisted items such as *Brunsvigia* and *Amaryllis* species that one still cannot find on the market. The Ainsley collection won the respect of all garden lovers.

Mr. Ainsley was one of the charter members of the American Amaryllis Society. He was a Vice-President of the Society from 1933 to 1935, and was active as the Southwest Regional representative on the Membership Committee until his death. We all owe him a deep debt of gratitude for his unselfish service.

During 1933, soon after the founding of HERBERTIA, he found his garden duties were becoming too strenuous for his limited physical strength. As a consequence much of the stock was turned over to a Southern California grower, and he retired to his Los Gatos home where he spent the last years of his life out in the sun amongst the flowers he loved. His new garden was built on a frost free knoll which overlooked the Santa Clara valley. There his closest friends could find him, ever cheerful, still very active, and as keenly interested as ever in garden topics. Much of his old bulb stock was gone, but many choice items remained. His work in breeding Tigridias and *Amaryllis* continued—may it still continue, for Gordon passed away quite suddenly due to a heart attack. His quiet passing was truly a reward for a lifetime of amazing courage and suffering.

Professor Rogers, one of his instructors at Montezuma School, pays him this tribute: “No young man of his class got more out of his work than Gordon did, and no one got better grades. His mind was alert and ever eager for new things. He endeared himself to us all by his sincerity, his industry and his keen sense of humor. He indeed had a high code of honor.” —*L. S. Hannibal*

J. MARION SHULL—ARTIST—PLANT BREEDER

AN AUTOBIOGRAPHICAL SKETCH

The old question of the relative importance of heredity and environment will probably never be answered to the complete satisfaction of all. While lack of suitable environment may hamper and even thwart heredity, the best environment can accomplish little unless there is a fair foundation in heredity on which to build.

In my own case a career closely related in some way to the great outdoor world of plant life might have been forecast at an early age. Environment was stubbornly against my early desire to train as an artist, to become an illustrator and find my place in the rapidly growing field of magazine and book illustration made possible by the newly invented half-tone process of engraving, for I was born into a rural Ohio home, in a community wherein the prevailing attitude toward pictures was to class them as "graven images," forbidden by Holy Writ. Music, aside from congregational singing, was likewise a thing of evil, and all musical instruments were tabu—not a very promising atmosphere for a growing lad whose greatest hungers and hopes lay in these fields.

Now I'm not complaining. My Father and Mother were gifted people, gifted above the average of their time and place, but they were caught in an environment that had triumphed over heredity and forced them into conformity. In their children, six boys and two girls, all but one of whom grew to maturity and are still living, heredity remained strong and insistent and for the most part had its own ultimate triumph over environment. Perhaps it were better said that the children sought and found environment in relative harmony with their inner needs as determined by heredity.

Our Mother was a great lover of flowers at a time when flower catalogs were few and farm income low; when distribution of ornamentals was largely by friendly exchange, hand to hand, or later by way of the accommodating postal service; when the early catalogs of the pioneering James Vick of Rochester were cherished as works of literature and art to be preserved and handled with care.

At the age of six, a back number of this catalog bearing my birth date, 1872, was turned over to me by my Mother and became my then most prized possession. Its black and white wood-cuts were promptly embellished with purple ink home-made from the juice of pokeberries, or with other colors soaked from colored papers, and these became my first "Works of Art." They must have been fearful and wonderful, and no doubt resulted in such iris and daylilies as I have never seen since or been able to produce in my own breeding garden of later years.

The home became a veritable green-house in winter, shelves at all windows, and at one time housed some two hundred distinct items. And Mother insisted on knowing the correct names of all her plants, and the correct pronunciation of their names when speaking of them. In the garden she had very definitely the botanic garden idea which she expressed in the wish that she could have just one of everything the catalogs offered—and a gardening man to help take care of them.

In the last quarter of the Nineteenth Century there were certain advantages accruing to the large family in the country, not so much to the parents perhaps, but assuredly to the children. With the nearest neighbor a mile away, and with a tramp of two miles to the village post office and school, the family was perforce thrown pretty much on its own social resources. Such families work together, play together, and each member contributes something to all the others. My oldest brother, chief mathematician of the family, mapped the stars, experimented in drawing and with electricity, presently brought home the first formal text on botany, a simple little elementary work of no particular consequence in itself—but three younger brothers including myself, became interested in botany, built our careers within this field of the natural sciences, one in genetics, one in plant physiology, and myself as a botanical artist.

But in the first place I collected plant materials not as a botanist but as source materials for application to design. I amused myself, and incidentally earned some money, by conventionalizing leaf and other plant forms into designs for china painting, wood carving, other decorative work in general. Leaves of plants were pressed and dried and filed in a cabinet for preservation of leaf forms, but supplementing these were great numbers of careful pencil sketches of plant material in natural position or carriage, leaves and their arrangement on the stems, flowers and fruits in their varying stages of development. These were made in summer from the live material and stowed away for reference in winter when fresh material was not available. Thus my botany and my art grew up side by side from the very beginning.

One brother was poet and linguist, working out his thoughts as he plodded behind the plow, jotting them down on scraps of paper while the team rested at the end of a furrow, later making his career as a teacher of Language and Literature at Michigan University. He brought into the family many books—and I read them as well as my own, spending most of my own small earnings in drawing materials.

Youngest member of the family profited by all that had gone before, entered college early, interested himself in natural science but shied away from the botanical field to deal with the things that feed upon plants, fruit flies, sphids, thrips, teaching genetics in the Department of Zoology at Michigan University. So much for the family background but now to the main theme.

Brief sessions with an Art Class in Indiana, and again at the Art Students' League in New York, terminated all too soon by reason of deficiencies of wherewithal. A collapsible purse had all too frequently to be replenished by interim sessions of school teaching or other trial work, proof reading in Cleveland, commercial art in Memphis, but these oddments neither singly nor all together could quite suppress the scientific strain that ran through the whole family. The uncertainty whether I should be artist or scientist finally resolved itself by making me something of both.

When the position of Botanical Artist for the Smithsonian Institution became vacant in 1903 through the death of Walpole I looked eagerly toward filling his place, but I was 800 long miles away and completely unknown to the Powers That Be. Contact by correspondence



J. Marion Shull

was cheering and encouraging but nothing came of it, and the vacancy remained unfilled. Then it dawned on me that for these very rare and highly specialized positions appointment is not a matter of favoritism, of "pull" in the slang of politics, but it is a matter of personal contact, personal acquaintance, of being personally known to those with whom you will have to work.

Having reached this conclusion I deliberately set about mastering another profession merely to get on the ground. Space here is not sufficient to go into detail as to how I arrived at this decision but I became a stenographer and typist and promptly received appointment in Government Service with the Post Office Department where I served just a year and seven days in that capacity and then went into the Forest Service as a member of its scientific staff to make illustrations for "The Forest Trees of the Pacific Slope" for Sudworth, Dendrologist for the Forest Service at that time.

Less than two years later I transferred to the Bureau of Plant Industry where ultimately I had made over 1700 scientific drawings in color in an exceedingly wide range of subjects. (Incidentally, the Smithsonian vacancy never was filled!)

Doing outside piece-work for the Forest Service while still preparing for stenography and typing, and before my formal admission to its scientific staff, had made a settled home seem practicable, as well as desirable, so I took on the responsibilities of the head of a household December 20, 1906, and returned to Washington January 1 following. By July 1, 1908, the present home in the Chevy Chase suburb of Washington was completed and occupied and once again there was garden land to use as I saw fit.

The Ohio home contributed of its garden wealth toward the new home in Maryland. Among these gifts were about a dozen *Iris* varieties, for my Mother had accumulated, even in that small number, probably more varieties of *Iris* than existed in any other rural home in the county. To these I added a few new ones from Farr of Wyomissing, leading American *Iris* grower of that period. They offered fascinating opportunities to a genetics-conscious lover of plant life in general, and that resulted in definite breeding operations by 1914, and from that time on the vegetable garden retreated ingloriously as the breeding of *Iris* advanced. Several new and interesting colors in *Iris* had resulted and had been given names because of local requests for distribution, notably a yellow that was quite distinctive at the time, which had been named Virginia Moore. This, by the way, partly by merit and partly by sheer luck, was the first *Iris* to receive the award of Honorable Mention by the American *Iris* Society which had been organized early in the year 1920.

In 1921 there appeared a brilliant seedling of *Iris trojana* by Lent A. Williamson which on its first appearance was seen toward the morning sun. It was so glowing that presently it received the name of Morning Splendor and was so registered. It again illustrated how merit and luck may work hand in hand to win success. Being a late variety its two bloom stems in 1922 appeared just at the time of the annual meeting of the *Iris* Society held that year in New York. By careful handling a

stem was taken to the show and as a result received exceptional and wide publicity that ultimately carried it to far places indeed. The margins of my small home garden had suddenly expanded till parts of it lay in England and France and even far-away Australia and New Zealand.

Always keenly alive to the facts of heredity I followed eagerly the genetics research of my younger brother, George, at the Station for Experimental Evolution of the Carnegie Institute at Cold Spring Harbor. It was about 1927 when I made my first crosses with daylilies and obtained a very interesting individual from *Hemerocallis serotina* (*Thunbergii*) by *H. fulva Europa* so extremely divergent from either parent that its hybridity cried aloud for recognition. Tempted by such small knowledge of genetics as I had acquired, largely by association, it was little wonder that the daylilies took on added interest. As could be expected the further use of this hybrid has led to a wide range of variation, a variation however, far beyond my expectations, both in color and form, colors from pale lemon yellow to deep orange; indescribably light pastels to deep Van Dyke reds, or even blackish purples, novel even if not beautiful. And in form there seems almost no limit to the variation.

In an autobiographical sketch one must of necessity stop at the end of the paper—not at the end of a career or a life. I shall close this sketch with a confession—that I am not digging up my Daylilies and Iris to grow vegetables in these trying days of war and shortages. The time will come when we shall be in desperate need of every civilizing influence that can be kept alive to after times. So I shall continue so long as strength is given me to labor in my garden for the loveliness that should outlive this all absorbing present ugliness of war.

JOHN VERTREES WATKINS

A BIOGRAPHICAL SKETCH

John V. Watkins, well known to Southern gardeners for his many worthwhile contributions to gardening literature, resigned on December first as Assistant Professor of Horticulture at the University of Florida to become associated with a large greenhouse establishment in Pennsylvania. At a 250,000 foot greenhouse in the southeastern section of that State, Prof. Watkins will have charge of the orchid department and will work in propagation.

A native of eastern Pennsylvania, Prof. Watkins was trained at the University of Pittsburgh, Harvard, Cornell and at the University of Florida. At the latter institution he was instructor in Floriculture and Landscape Planning and had complete charge of the greenhouses and gardens. In addition, much time was given to selective breeding and flowering studies in *Hemerocallis*. Many of the findings from these studies were published in *HERBERTIA*. The growing of a large demonstration garden of annuals, flowering, and disease resistance studies in garden chrysanthemums also received attention in season.

Prof. Watkins is the author of five University Bulletins, the most popular of which are "Propagation of Ornamental Plants" and "Orchids in Florida." Scores of gardening articles were written and radio talks given by Prof. Watkins, and he has been southern authority for several gardening guides and "how" books of national circulation. He has served as consulting planner on many beautification projects in his home city and for several buildings of the University system, and has participated in many garden symposiums and short courses.

Although it has been necessary to dispose of most of the daylilies that grew in the garden at his home, it is hoped that it may be possible for him to acquire a new group of plants after settling permanently in Pennsylvania.—B. Y. T.

A DECADE WITH AMARYLLIDS

W. M. JAMES, *California*

Ten years ago the American Amaryllis Society was organized in Florida. The activities of the Society were to be recorded in a year book. Today this Society is still functioning, the annual is known as HERBERTIA (See Plate 244.) and is received by members of the Society all over the world, even though war has curtailed such activities somewhat.

Much progress has been made in the general knowledge of the Amaryllids and many new kinds have been introduced during the last ten years. It is now easy and profitable for the florist to have early *Narcissus* flowers because we have learned that the flowering time of these bulbs is controlled by manipulation of storage temperatures. And many choice kinds of Amaryllids will be available in larger quantities because we have learned to propagate these bulbs by cutting them. Some errors in nomenclature have been corrected. Others are in the process of correction. I wonder how many of those who will read this realize how much time and work is necessary to complete a gigantic task of this nature.

One development I do not understand. In most parts of the United States the daylily (*Hemerocallis*) has become very popular. Because of this interest many new hybrids have been developed and a great deal of data on its cultural requirements and habits collected. Why is this plant almost unknown in Southern California?

My personal experiences with Amaryllids during this past decade have been very interesting and have provided a great deal of pleasure. At Las Positas Nursery we gradually extended our correspondence in an effort to increase the collection of bulbous plants. It is quite a thrill to watch plants or seeds, received from a far corner of the earth, develop until finally they bloom. In the past, as part of my vocation, an effort was made to find methods of propagating the more promising plants in commercial quantities. In the future, as an avocation, I hope to learn some of the "whys and wherefores."

Illustrative of propagation difficulties in the past decade is a comment by the editor on page 181 of the 1942 HERBERTIA which I have



found to be correct. As soon as the first pod in an umbel shows signs of ripening, the whole stem can be picked and all the pods will mature and produce good seed if placed in a warm airy place. Dr. Traub suggests a paper bag, but in Santa Barbara the pods would mildew badly and not mature properly in this type of container. I used trays with wire bottoms and used the same kind as a cover. On a hot, dry day a breaking *Alstroemeria* pod will throw seed as far as ten feet. I learned to use this method with many kinds of plants—such as *Brodiaea*, *Leucocoryne*, *Amaryllis*, *Nerine*, etc., etc. And the germination seems to be just as good as that from seeds fully matured on the plant. After a certain point there is apparently enough moisture and nourishment in the stem and pods to mature the seeds.

During unfavorable weather I have cut flowers of some plants, pollinated them and matured seeds with the stem in water in the house. Sometimes extra light and heat must be provided. Some of the *Nerines* are especially adaptable to this method. The hollow stems *Amaryllis* have a tendency to rot before the seed matures.

And so on. I would not attempt to review all the happenings and progress in Amaryllids for the past ten years. This is very nicely recorded in the first ten issues of HERBERTIA (See Plate 244; first nine volumes) In each edition of HERBERTIA there were comments and articles by new writers. In the next ten years I hope the Society will receive many new members who will express themselves in HERBERTIA. That is the logical way to acquire data and information which we are all anxious to receive.

HERBERTIA COVER DESIGNS

HAMILTON P. TRAUB

The series of cover designs for HERBERTIA was begun in 1937 with the unique impressionistic design of the Amaryllis Family by the renowned artist, Col. Edward Steichen. This was an appropriate cover for the issue commemorating the 100th. Anniversary of Herbert's Amaryllidaceae. For the 1938 issue, dedicated to the Netherlands, Henrik Willem van Loon had planned to provide the cover but on account of sickness he could not carry out his plan. In this emergency, the design was made by the writer. It is based on the plate of *Amaryllis vittata* in Trattinick's Thesaurus Botanicus. The design on the reverse side of the Herbert Medal is from the same source.

The cover for the South African Edition in 1939 was appropriately executed by the South African artist, Cythna Letty. It features *Cyrtanthus Tuckii* var. *transvaalensis*. Mrs. Wilhelmina F. Greene, a noted Florida artist, created the design for the 1940 issue. It portrays the Blue Amaryllis that had flowered in Florida in that year.

Beginning in 1941, a notable series of cover designs was begun by the eminent artist and horticulturist, J. Marion Shull. Up to the present four of these have been executed—three have been published. For the Daylily issue, 1941, Mr. Shull portrayed the Genus *Hemerocallis* as exemplified in the hybrid clone *La Tulipe*. *Alstroemeria Ligtu* was featured on the cover of the Alstroemerid Edition, 1942, and *Ixiolirion tataricum* adorns the cover of the present 10th. Anniversary Edition. The

original was produced in June 1943 from sketches made from plants in the garden of Dr. J. S. Cooley, Beltsville, Maryland. The fourth design in this series based on the onion, *Allium Cepa*, will be reproduced on the cover of the Allieae Edition, Volume 11, 1944.

The members will be interested to know that there is a plan back of these cover designs. The amaryllids are excellent subjects for use as a basis to enrich the artistic tradition of the world. In this group the general theme of the umbellate inflorescence with spathes unites the members but in many other details there is very great diversity. It is the purpose to sponsor designs for all of the Tribes of the Amaryllidaceae. When a sufficient number of such designs are available, they will be gathered together into a portfolio for use in decorative art.

TABLE I

Herbertia cover designs, 1937 to 1943; and contemplated future cover designs.

I. FAMILIES			
Family	Representative Species	Artist	Year
ALSTROEMERIACEAE	Alstroemeria Ligtu	J. Marion Shull	1942
AMARYLLIDACEAE	Impressionistic design	Col. Edward Steichen	1937
II. AMARYLLID TRIBES			
Tribe	Representative species	Artist	Year
HEMEROCALLISEAE	Hybrid Hemerocallis clone La Tulipe	J. Marion Shull	1941
AGAPANTHEAE	Agapanthus africanus		1945
ALLIEAE	Allium Cepa	J. Marion Shull	1944
GILLIESIEAE	Miersia chilensis		1946
IXIOLIRIEAE	Ixiolirion tataricum	J. Marion Shull	1943
BRUNSVIGIEAE	Brunsvigia rosea		1947
CYRTANTHEAE	Cyrtanthus Tuckii var. transvaalensis	Cythna Letty	1939
HAEMANTHEAE	Haemanthus multiflorus		1948
AMARYLLISEAE	Amaryllis vittata	Hamilton P. Traub	1938
	Worsleya procera	Mrs. Wilhelmina F. Greene	1940
ZEPHYRANTHEAE	Zephyranthes grandi- flora		1949
GALANTHEAE	Galanthus nivalis		1950
NARCISSEAE	Narcissus poeticus		1953
EUSTEPHIEAE	Phaedranassa Carmioli		1952
EUCHARIDEAE	Hymenocallis Floridana		1951

The designs that have already appeared and also those that are contemplated for the next decade are listed in Table I. It is the object to include at least one design for each Tribe of the Amaryllidaceae. Although species are indicated in Table I, the future plans are not rigid and changes in the subjects may be made in case that should seem desirable.

1. REGIONAL ACTIVITY AND EXHIBITIONS

MID-WEST GARDEN CLUB OF THE AIR

DARRELL S. CRAWFORD, *Kansas*

Unique in the history of Garden Clubs is one that requires only the turning of a radio dial for attendance daily for thirty minutes, Tuesday through Saturday. Our leader is the talented Mrs. Helen Field Fischer. The Mid-West Garden Club of the Air is conducted over Station KFNF, Shenandoah, Iowa.

“Dues” are only the faithful attention and eagerness for greater knowledge of plant science and particularly gardening, in any or all its branches. “Flower Shows” are the flower pictures vividly drawn by word in each letter of garden scenes or discoveries that listening members send to the leader, Mrs. Helen Field Fischer, to read on the air. When problems of culture or identification arise it is possible to have an answer in forty-eight hours after the broadcast anywhere from Missouri, Iowa, Minnesota, North Dakota, South Dakota, Nebraska or Kansas.

This great privilege of intimate sharing of gardening experience can only be appreciated by flower enthusiasts who are isolated and who would have to spend lonely periods of research or disappointing trial and error were it not for this modern garden club that takes advantage of the latest inventions to reach its members.

Since the beginning of the Club in 1923 Mrs. Fischer has been giving the daily gardening talks which have transformed the gardens and also the outlook of thousands in the great American Midland.

Members who visit Shenandoah’s famous gardens are invariably invited to address the local garden club. Shenandoah’s gardeners are so well known from radio letters that we know them by their given names.

It is indeed a pleasure to open important garden magazines and see articles by members of our Club of the Air. The capacity to write such articles was developed and encouraged by writing of gardening matters in radio letters for our family of gardeners.

Distinguished visitors have enjoyed the informality of the Radio Garden Club and have appreciated the showers of friendly letters they received after their broadcasts. In our homes by radio we have thus enjoyed visits with Alfred Hottes, author and garden editor; Elizabeth Werry, of Wallace’s Farmer; Arthur Rapp, Iowa expert on growing wild flowers; Mrs. Dorothy Biddle, on flower arrangements; Ernest Thompson Seton, and Ralph Hubbard, authorities on Indian Lore; Mrs. Viola Wilson, who tames humming birds, and a host of others.

From the thousands of garden questions sent to Mrs. Fischer—200,000 letters during the first ten years of the Club—it was clear that a popular book on plant science was needed. Mrs. Fischer, in collaboration with her daughter, Mrs. Gretchen Harshbarger, landscape architect and illustrator, produced such a book,—Flower Family Album. It contains examples of the species and cultivated forms of each plant family

represented among cultivated flowers. As a text it has been used for our radio plant science lessons, and it is now also available in hundreds of clubs, schools and libraries. It is important to note that members were fascinated to discover that petunias and potatoes were close relatives. Such stimulation has encouraged members to further study and research.

One member, in spite of a severe physical handicap, Mr. Howard Bowlin, of Missouri, has developed an extensive perennial and rose garden. He has shared by air, letters from England, written by a well known member of the Royal Horticultural Society. This gentleman entertained a brother of Howard Bowlin in the armed forces on leave, discovered their mutual interest. His letters about English gardens, in spite of the war, show that gardeners are the same the world over.

Whenever members have seeds of unusual plants these are announced by the Leader, Mrs. Fischer, giving the name and address of the member offering to share his good fortune. The seeds are then furnished at the nominal club rate of ten cents per packet. In this way many new items have been tested and distributed over a wide territory in the American Midland. The writer was happy to supply several items and suggested that ten cent War Stamps be used for seeds and this suggestion was quickly adopted.

The great interest in the daylily, *Hemerocallis*, here has been in great measure due to the untiring efforts of Mrs. Fischer, who made many new clones available by special arrangements in collections to gardeners of our Club. No other flower responds so well in the hot, dry summers of the Midland, and gives abundant flowers over so long a period.

All of this reflects the spirit and generous heart of a pioneer in radio and farm improvement, Mr. Henry Field, who gives free use of his radio Station KFNF for a neighborly, friendly Garden Club.

2. DESCRIPTION, CLASSIFICATION AND PHYLOGENY

REVIEW OF AGAPANTHUS AND TULBAGHIA

J. C. TH. UPHOF, *Washington, D. C.*

Repeatedly we encounter plants or groups of plants that can not be easily classified, due to the fact that they have characters common to more than one genus, sub-family or even family. This may be confusing from a systematic or taxonomic standpoint, but from a phylogenetic and evolutionary viewpoint, however, this is extremely interesting. We encounter such instances among the *Amaryllidaceae* and *Liliaceae*. Here we find a number of borderline genera that were once grouped among the *Liliaceae* but have now been transferred to the *Amaryllidaceae*. Two such genera will be taken up in some detail,—namely *Agapanthus* and *Tulbaghia*.

1. THE GENUS AGAPANTHUS

Some readers may be surprised to find *Agapanthus* grouped with the *Amaryllidaceae*, since it was formerly classed with the *Liliaceae*. Hutchison, in his *Families of Flowering Plants*¹, states that “The old distinction between the *Liliaceae* and *Amaryllidaceae*—‘stamens 6, ovary superior’—in the one, and ‘stamens 6, ovary inferior’ in the other, was too simple, and separated genera which are otherwise very closely related. I have therefore, taken a somewhat drastic step in including in the *Amaryllidaceae*, certain groups formerly placed in the *Liliaceae*.” Hutchinson believes that the umbellate flower cluster with its bracts are of more importance than the differences between a superior and inferior ovary. He considers the tribe *Agapantheae* the most primitive one in the *Amaryllidaceae* and considers it a link between the two families. The underground part of *Agapanthus* is rhizomatous, while the rootstock of the others are corms or bulbs.

The relationship between the two families has been discussed by Krause (*Liliaceae*, in *Die Natürlichen Pflanzenfamilien* 2 ed. Vol. 15 a:238-239, 1930) and by Pax and Hoffman, who describe the *Amaryllidaceae* in the same volume. The latter point out that the *Amaryllidoideae*, a subfamily of the *Amaryllidaceae*, closely approach the *Liliaceae*; and that the *Agavoideae*, among the *Amaryllidaceae*, show resemblance to the *Dracaenoideae* among the *Liliaceae*. The relationship of some of the genera from an embryological standpoint, will be considered later.

The genus *Agapanthus* was at first supposed to be monotypic. Later on more species were added, and the total number of species admitted is now nine. While the genus was still in its monotypic stage, it was observed by many collectors that the supposedly single species, *Agapanthus umbellatus*, was characterized by deciduous and evergreen forms. Differences were also observed in the inflorescences, and in the shape of the flowers. Some had more erect, others had drooping flowers. It was

¹ Hutchinson, J. *Families of Flowering Plants*. II. Monocotyledons. pp. 129-132. 1934.

therefore natural that the careful observer suspected that this was a heteromorphic group. *Agapanthus umbellatus*, L'Herit., therefore required thorough investigation. It is of interest to note some of the highlights in the history of the nomenclature of this plant.

Linnaeus described it under the name of *Crinum africanum*. In his *Species Plantarum*² he gives the native country as "Aethiopia." He cites the beautiful illustration of Commelin³. About 14 years previously we find that Breynius, in his *Prodomus*⁴, mentions the plant under the name of *Hyacinthus africanus*. The first mention of this species was by Hermann in his *Cataloge* published in 1687⁵, and one of the first illustrations is to be found in Plukenet's *Almagestum*⁶. He reports the plant as flowering at Hamton Court not far from London. Also an earlier illustration from Seba in his *Thesaurus* is worthy of note⁷. The plant is also described in the well known work of Miller⁸.

In 1788 L'Heritier established the genus of *Agapanthus*⁹, and described *A. umbellatus* as the only species. Leighton¹⁰ points out that this name was only given to the small *Agapanthus*¹⁰. The author notes that "The first clear indication of the inclusion of a second species under this is found in Redouté's *Liliaceae*¹¹. He recognizes two different forms in this species, but does not consider the second sufficiently distinct to warrant giving it specific rank. Redouté's figure represents *A. orientalis*, a larger plant which is found in the southern and eastern part of South Africa. The distribution of the latter species is from Krysna eastwards along the coastal region to Natal and Zululand and thus it is unlikely that it was introduced to Europe before *A. africanus* (L.) Hoffmzg. Subsequently attempts were made to relegate the true *A. africanus* to the rank of a variety, but it should be noted that in Loddiges *Botanical Cabinet*¹² it is given specific rank.

Let us now consider this genus from the standpoint of relationship to other genera. Stenar¹³, on the basis of an embryological study, concluded that the *Agapanthieae* are more closely related to the *Allieae* than was at first supposed, and that both could be united into one group. He believes that *Agapanthus* and *Tulbaghia* are South African *Allieae*, the former with a rhizomatous rootstock. *Agapanthus* is phylogenetically the older of the two genera. *Tulbaghia* although showing relationship to *Agapanthus* is considered a derived form. The embryo-sac is of the *Scilla*-type with hemianatropous ovules which shows relationship with

2 Linnaeus Carolus. *Species Plantarum*. ed 1. 1:292, Holmiae, 1753.

3 Commelin, Johanni. *Horti Medici Amstelodamensis. Rariorum*. t. 67. Amstelodami, 1697.

4 Breynius, Jacobus. *Prodomi fasculi rariorum plantarum gendani*. 1739.

5 Hermann, Paul. *Horti Academici Lugduni-Batavi. Lugduni Batavorum*, 1687.

6 Plukenet, Leonard. *Almagestum Botanici Mantissa*. London, 1696.

7 Seba, Albert. *Locupletissimi Rerum Naturalium Thesauri*. 133, t. 19 fig. 4, Amsterdam, 1697.

8 Miller, Phillip. *The Gardeners Dictionary*. 140 t. 210, London 1733.

9 L'Heritier de Brutelle, C. L. *Sertum Anglicum*, Paris 1788.

10 Leighton, Frances M. Some changes in Nomenclature in: *Journ. of South Afr. Bot.* 5:55-58, 1939.

Leighton, Frances M. A Brief Review of the Genus *Agapanthus*. *Herbertia*. 6:105-106, 1939.

11 Redouté, P. J. *Les Liliacées*. t. 403. Paris 1802-1816.

12 Loddiges, Conrad. *Botanical Cabinet. Agapanthus minor* 1:t.42, 1817.

13 Stenar, Helge. *Zur Embryologie der Agapanthus-Gruppe*. *Botaniska Notiser*. 520-530, 1933.

Nothoscordum and *Allium*. Furthermore *Tulbaghia* species possess the same odor as species of *Allium*. On the following pages an attempt is made to give a description of the known species of *Agapanthus*. It is to be regretted that some of the original descriptions are inadequate.

Genus AGAPANTHUS L'Heritier

Herbaceous, perennial plants. Rootstock relatively short and usually stout; roots fibrous or fleshy. Leaves deciduous or persistent, succulent, often 2-ranked; linear to sword-shaped or almost strap-shaped. Inflorescence an umbel; base of the pedicels surrounded by deciduous or persistent spathe-valves which are membranous or green. Perianth funnel-shaped to campanulate, composed of 6 united members, formed into 2 cycles. Stamens 6, inserted at the throat of the tube of the perianth. Anthers small, oblong, introrse. Filaments filiform. Style filiform; stigma very small. Ovary 3-celled, narrow, sessile containing numerous ovules. Fruit a capsule, coriaceous, 3-valved, oblong. Seeds flat.

DESCRIPTION OF SPECIES

1. *AGAPANTHUS AFRICANUS*, (L.) Hoffmzg., Verzeichn. Pflanzen 35, 1824; Leighton. Journ. South Afr. Bot. 5:55-58, 1939; *A. africanus*, (L.) Dur. and Schinz., Consp. Flor. Agric. 5:354, 1893; *Crinum africanum*, L., Species Plantarum ed. 1 1:292, 1753; *Tulbaghia Heisteri*, Fabric., Enum. Plant. Helmstad. 1763; *Mauchlia linearis*, Thunb., Nov. Gen. 3: 1781; Thunb., Prod. Plant. Capensis. 60, 1794; *M. africana*, Dahl., Observ. Bot. Syst. Gen. 1787; *Agapanthus umbellatus*, L'Her., Sertium Anglic. 17, 1788; Aiton Hortus Kewensis ed. 1 414, 1789; Willd. Spec. Plant. 2 pt. 1:47, 1799; Redout Lil. 1:6, 1802; Roem. et Schult. 7 Pt. 2:997, 1830. (9n part); Kunth. Enum. Plant. 4:478, 1843; Engl. und Prantl. Nat. Pflanzenfam. led. 2 pt. 5:54, 1888; Pax and Hoffm. 2 ed. 15 a: 1930; *A. umbellisferus*, Poir, Enc. Method. Bot. Suppl. 1:155, 1810; *A. minor*, Lodd., Bot. Cab. 42, 1817.

Description—Herbaceous, evergreen. Rhizome is stout, roots are thick and rather fibrous. From 8 to 18 leaves to each plant; two ranked, erect to suberect, 24 cm. long and 0.9 to 1.2 cm. wide, somewhat leathery, apex obtuse to subacute. Valves of the spathe are deciduous. Peduncles are erect, 24 to 50 cm. long. Flowers 12 to 30 cm. long, pedicels 1.5 to 4.5 cm. in length. Bracts thread-like. Perianth 2.5 to 3.5 cm. long, deep blue to blue-violet. Outer segments 0.5 to 0.6 cm., inner segments 0.7 to 1 cm. broad, and 1.5 to 2.20 cm. long. Stamens are shorter than the perianth and are as long as the pistil.

Distribution.—Cape Peninsula : Clearing, Kirstenbosch; Esterhuysen nr.697—Kal Bay Mt. Walley Dod. nr.758.—Stellenbosch; Banhoek, Martley, Bolus Herb. nr.22380. Paarl: Robert Vlei, Pillans nr. 6791.—Caledon: Kleinmond, Fuller nr.109.—Mangklip, Pillans nr. 8330.—Riversdale: Ferguson Nat. Bot. Gard. 807/ 35. Langeberg Muir nr.1344.

A. africanus is the type species of the genus. The studies of Miss Leighton have shown that *A. africanus* (L.) Hoffmzg. is the valid name and that *A. umbellatus* L'Her. is a synonym. L'Heritier who founded the genus in his Sertum Anglicum (1788), according to Miss Leighton, "gave the epithet *umbellatus* to the species, but from his citation it is certain that he was describing the small *Agapanthus* only."

2. *AGAPANTHUS WALSHII*, L. Bolus, Novitates Africanæ. Annals Bolus Herbarium. 3:14, 1920.

Description.—Herbaceous plant, deciduous, 60 to 70 cm. high. Leaves linear, acute, subcoriaceous, about 19 cm. long and 1 cm. wide. Scape about 15- to 20-flowered. Spathe deciduous. Flowers pendulous. Perianth 3 to 5.4 cm. long; segments 1.4 to 1.5 cm. long. Tube longer than the segments. Segments somewhat spreading. Fruit unknown.

Distribution.—Occurs in Cape Province; Southern Region; Caledon Div. near Steenbras Railway Station, alt. about 600 meters. Flowers from December until January. Bolus Herbarium nr.15675. This species has been named after Mr. A. Walsh.

This species differs from *A. africanus* (L.) Hoffmzg. (Syn. *A. umbellatus* L'Her.) especially in the perianth-tube which is two to three times longer than the segments.

3. AGAPANTHUS PENDULUS, L. Bolus, Novitates Africanæ. Annals Bolus Herbarium. 3:80, 1920.

Description.—Herbaceous, leaves deciduous, obtuse or subacute, about 36 cm. long and 3.5 cm. wide. Scape many-flowered, flowers drooping, about 40 to 45 cm. long. Pedicels 2.5 cm. long or longer. Perianth 2.5 to 3.4 cm. long. Tube longer than the segments. Segments not or very little spreading. Filaments straight. Pollen greenish. Ovary cylindric, about 1 cm. long; style 2 cm. long. Capsule acute, three-angled.

Distribution.—This species has been reported from Transvaal: Lydenburg. It is apparently related to *A. Walshii*, L. Bolus.

4. AGAPANTHUS ORIENTALIS, Leighton, Some Changes in Nomenclature II. Journ. South Afr. Bot. 5:57, 1939; *A. umbellatus* Red. Liliaceæ 403, 1813; *A. umbellatus* var. *maximus* Edw. Bot. Reg. 7, 1843.

Description.—Rhizome stout, developing fibrous and rather thick roots. Leaves succulent, arcuate, about 70 cm. long and 5.5 cm. wide, 10 in number. Peduncle erect, terete, 60 cm. or more in length. Valves of the spathe deciduous. Up to 110 pedicels which have a spreading habit. Bracts large and narrow to thread-like. Perianth 4.5 to 5.5 cm. long; tube 1.5 to 2 cm.; segments spreading 2.7 to 3.5 cm. in length. Color of the perianth blue. Filaments sometimes longer than perianth. Pistil 4 cm. in length, ovary [1 cm. and style 3 cm. in length].

This species is closely related to *A. multiflorus* Willd., in fact Miss Leighton suggests that upon a more careful investigation both may be identical.

Distribution.—Pondoland: Port St. Johns Pillans nr.7198. Type species in the Bolus Herbarium. Kentari: Pegler nr.629. Humansdorp: Diep River, Herlaquin Bolus nr. 2491.

According to Miss Leighton this species is the one that is commonly grown in gardens (HERBERTIA 1939). There is an excellent color plate of this species in Edwards' Botanical Register 29:7, 1843 under the name of *Agapanthus umbellatus* var. *maximus*.

5. AGAPANTHUS CAULESCENS, Sprenger, Gartenflora 50:21-22 pl. 1487, 1901; Bull. Soc. Tosc. Ort. 42, 1902.

Description.—Rhizomes relatively stout. Root fibrous. Leaves ensiforme, toward the middle channeled, rounded at the apex. The flowers blue, at first erect, later on drooping. Deep blue streak in middle of perianth-segments. Pollen more or less white. Style white and persistent on young fruit. Capsule three-angled.

Distribution.—This species is reported native to Transvaal. Carl Sprenger grew it at his Villa de Biase, Vomero near Naples. He received the seeds from his friend Dietrich who collected them at a considerable elevation on the Drakenberg. The plant flowered for him for the first time in 1900.

6. AGAPANTHUS INAPERTUS, Beauverd, Bull. Soc. Geneve. Ser. II. 2:179, 194, 1910; Worsley Journ. Royal Hort. Soc. 39:363-365, 1913; Sealy, Curtis' Bot. Mag. t.9621, 1942; *A. Weillighii*, Hort. Gard. Chron. Ser. III. 54:125, 1913.

Description.—Rhizomes stout, creeping, roots thick and fleshy. Height of inflorescence about 75 cm. Leaves 5 to 8,— 24 to 55 cm. long, and 1.5 to 2.5 cm. wide, deciduous, stiff, glaucous, slightly to deeply channelled, erect, apex rounded to obtuse. Scape 50 to 65 cm. or more in length. Spathe-valves deciduous, membranous, broadly ovate, pointed, 2.8 cm. long and 2.4 cm. broad. Up to 100 flowers in an umbel. Pedicels 3 cm. long. Flower buds somewhat erect. Opened flowers drooping. Perianth tubular, 3 cm. long and 2 cm. wide. Tube 1.6 cm. long, deep blue near the tube and lighter in color along the free lobes of the perianth. Stamens shorter than the limb, somewhat exerted. Filaments attached to perianth at the base. Anthers about 2mm. long. Pollen variously described as yellow or gray. Ovary 8 to 10 mm. long.

Distribution.—Beauverd received material for the description of the plant from Shilouwana, Western Transvaal through the aid of the missionary H. Junod. It

is also reported that Worsley received a specimen from C. G. van Tubergen in Haarlem, Netherlands. It has been reported that this specimen was originally sent by Max Leichtlin from Baden-Baden in about 1898, bearing the name of *A. Weillighii*. Worsley is of the opinion that Leichtlin received an earlier importation of this species than did Beauverd in 1910.

Judging from descriptions and illustrations, this plant produces on each scape an unusually large number of flowers.

7. *AGAPANTHUS HOLLANDII*, Leighton, Plants, New and Noteworthy, South Afr. Gardening and Country Life. 24:71, 1934.

Description.—Herbaceous, deciduous. Spathe either persistent or more or less withered or deciduous, membranous. Flowers pendulous; tube longer than segments. Stigma included. Perianth-segments more or less spreading toward the apex.

Distribution.—*A. Hollandii* is probably related to *A. inapertus* of which it may be a variety or subspecies.

8. *AGAPANTHUS LONGISPATUS*, Leighton, Plants, New and Noteworthy, South Afr. Gardening and Country Life. 24:71, 1934.

Description.—A very short description is available of this plant which can not be considered complete: plant herbaceous, deciduous; Spathe green and persistent during flowering.

Distribution.—Native to Cape Province.

9. *AGAPANTHUS CAMPANULATUS*, Leighton, Plants, New or Noteworthy, South Afr. Gardening and Country Life. 24:71, 1934.

Description.—Herbaceous, deciduous. Spathe deciduous or if persistent more or less withered and membranous. Flowers ascending or spreading; tube as long or shorter than the segments. Perianth campanulate, segments slightly undulate.

Distribution.—This species has been collected in Natal together with *A. Hollandii*, Leighton.

2. THE GENUS TULBAGHIA

Linnaeus has given this group of plants the name of *Tulbaghia* in honor to Tulbagh, a Dutch governor at the Cape of Good Hope who died in 1771. Sometimes the name of the genus is spelled *Tulbagia*, but the first name is the correct one. *Tulbaghia* is an African genus. Most of the species are found in the southern half of the continent, especially toward the Cape of Good Hope. For a long time only two species were known to science. Willdenow who edited the fourth edition of Linnaeus' *Species Plantarum*¹⁴ mentions *T. alliacea* and *T. cepacea*, both reported from the Cape. He called the former "*knoblauchartige Tulbaghie*" and the latter was named "*zwiebelartige Tulbaghie*," indicating that the scent of garlic and onion were noticed. In 1871 Baker recognized 7 species.¹⁵ He divided this genus into two subgenera, e.g. *EUTULBAGHIA*: [*T. capensis*, *T. alliacea*, *T. acutiloba*, *T. Dregeana* and *T. hypoxidea*] and *OMENTARIA*: [*T. cepacea* and *T. violacea*.] At present 24 species are known.

Although many species of *Tulbaghia* are very attractive, they are very seldom cultivated. The neglect is not deserved. Some species have been described and illustrated as colored plates. On Plate 806 of Curtis's *Botanical Magazine* (1805) we notice *T. alliacea*. Of this species it is stated that it is not uncommon in low sandy places in Cape Province, where it flowers in July. The Colonists called it "*Wilde Knoblook*" (Wild Garlic) and it was used by them, when stewed in milk, for disorders of the breast. Another colored illustration represents *T. Ludwigiana*, on plate 3547 of the same Journal published in 1837. *T.*

violacea was illustrated the same year,—plate 3555. One of the latest colored illustrations was contributed by Verdoorn, *T. fragrans*, Verdoorn, plate 438, Flowering Plants of South Africa (1931).

Different species of *Tulbaghia* show a number of interesting characteristics. The flower is very interesting. There is the corona, sometimes called a secondary corolla, which is somewhat similar to the corona in *Narcissus*. The six stamens are also peculiar; they are sessile and have very short anthers. Three stamens are usually much longer and are inserted on the corona, and the other three are found lower down in the flower and are attached to the corolla tube. These characteristics are well illustrated in longisection of the flowers of *T. Ludwigiana* and *T. fragrans* in the above mentioned colored plates.

The inflorescence is umbellate. Though small their bright color, sweet scent and excretion of nectar attracts numerous insects belonging to different species. Burchell in the account of his Travels (1810-1815), mentions fields of *T. alliacea*, smelling strongly of garlic when crushed, but the flowers giving out sweet scent toward the evening.

The habitat of *Tulbaghia* species ranges from dry grassy hillsides to swamps. Species are found from sea level to a height of 8000 feet.

Genus TULBAGHIA Linn.

Herbaceous, perennial plants. Bulbs relatively small, round to oval, producing a scent similar to *Allium* species. Leaves 3 to 10 to each bulb, deciduous, linear to lanceolate, sometimes ensiform, not seldom grooved, glabrous. Inflorescence a 5- to 40-flowered umbel. Spath-valves 2, usually membranous. Flowers small, brightly colored. Perianth gamophyllous, hypercrateriform; tube oblong or cylindrical; segments oblong to lanceolate. Throat of the flower surrounded by a corolla-like corona which may be entire and annular or may be composed of three processes that are distinct and placed opposite the inner segments. Stamens 6, sessile or with very short filaments of which three are usually inserted on the lobes of the corona and the remaining three are found lower down on the corolla tube. Ovary sessile, often 6-grooved, 3-celled, ovules many in a cell; style short, about 2 mm. long, columnar; stigma small, more or less capitate. Fruit a capsule, 3-valved. Seeds blackish, compressed, oblong; albumen fleshy. Testa loose.

Subgenus I. EUTULBAGHIA Baker

1. TULBAGHIA CAPENSIS, Jacq. Ejus. Hort. Bot. Vind. 2:t.115, 1770-1776; Linn. Mant. Plant. Alt. 223, 177; Baker. Journ. Linn. Soc. 11:370, 1871; *T. alliacea*, Gawl., Bot. Mag. t.806, 1805; Kunth. Enum. Plant. 4:481, 1833. (non. Linn. fil.).

Description.—Corm globose; roots fleshy. Outer leaves membranous, short, leaves 8 to 12, linear, 30 to 35 cm. long, 8 to 12 mm. wide, fleshy. Scape 32 to 60 cm. long. Umbel carries 6 to 8 flowers. Spathe-valves lanceolate, membranous, small. Pedicels 1.8 to 2.5 cm. long. Perigone 8 mm. long, purplish-green. Perigone-segments reaching half the length of the tube, lanceolate. Lobes of the corona

14. **Willdenow, C. L.**, Linnaeus, Species Plantarum. ed. 4 2: 33-34, Berolini, 1799.

15. **Baker, J. G.** A Revision of the Genera and Species of Herbaceous Capsular Gamophyllous Lilliacae. Journ. Linn. Soc. Botany. 11:369-372, 1871.

deeply cleft, lanceolate, of about the same length as the perigone-segments, purplish-brown. The higher stamens opposite the staminods.

Baker distinguished *T. capensis* var. *gracilis*, a form that is less robust, its leaves being about 7 to 10 cm. long and 3 to 4 mm. wide.

Distribution.—Native to South Africa. No special locality is given. The var. *gracilis* has been reported from Little Namaqualand; Hardeveld, 600 to 1000 meters. Zeyher nr.4268.

2. TULBAGHIA SIMMLERI, Beauverd, Un nouveau Tulbaghia du Transvaal. Bull. Herbar Boissier. 2 Ser. 8:988, 1908.

Description.—Bulb ovate, tunicate. Leaves lorate-lanceolate. Corona ureolate crenate-trilobate, flowers light pink. Tube cylindric, short. This species is related to *T. Dregeana* and *T. natalensis*. It differs from the former by its pink colored flowers and its much larger leaves.

Distribution.—Native to Transvaal. No special locality is given.

3. TULBAGHIA DREGEANA, Kunth., Enum. Plant. 4:484, 1833; Baker, Journ. Linn. Soc. 11:371, 1871.

Description.—Outer leaves membranous, brown, 2.5 to 3.5 cm. long. Leaves linear, 7.5 to 15 cm. long, relatively firm. Scape 30 cm. long, slender. Umbel carries 4 to 8 flowers. Spathe-valves lanceolate. Pedicels 6 mm. to 2.5 cm. long. Perigone 6 to 8 mm. long, greenish. Segments 1 to 2 mm. long, lanceolate. Corona ring-shaped, brownish, crenate, shorter than the lobes of the perigone. The three longest stamens reach to throat of corona.

Distribution.—Native to Little Namaqualand; near Lily Fontein and Ezels Fontein, Drege nr.2658.

4. TULBAGHIA LUDWIGIANA, Harvey, Bot. Mag. t.3547, 1837; *Tulbaghia alliacea* var. *Ludwigiana*, Baker, Thiselton-Dyer, Flora Capensis 6:405, 1896-1897.

Description.—Leaves 15 to 20 cm. long, 2.5 cm. wide, bright green, glabrous, ensiform-ligulate, more or less acute, rigid, glabrous. Scape erect, narrow, glabrous, 60 cm. or more in height. Umbel of 6 to 8 flowers or more. Spathe-valves membranous, ovate, acute; pedicels 2.5 to 5 cm. long, slender, filiform. Tube 15 mm. long, greenish-purple or green with purplish streaks. Segments of perigone ovate, obtuse, as long as tube. Corona thick, fleshy, yellow, shorter than the segments forming a crown at the mouth of the tube. Filaments adnate to the tube of the perigone. Ovary glabrous, oval, with resinous glands or dots, 6-grooved. Ovules many. Style cylindrical, erect. Stigma subcapitate, truncate.

According to Harvey bulbs of this species were sent to the Ludwigburg Garden, Cape of Good Hope from the borders of Cafferland by Mr. Zier in 1834. This species has a strong scent resembling that of onions. Baker considers this plant a variety of *T. alliacea* L. to which it is apparently related.

5. TULBAGHIA CAMPANULATA, N. E. Brown, Diagnoses Africanæ XIII. Bull. Misc. Inf. Kew. nr.175: 136, 1901.

Description.—Corm not described. Leaves 20 to 30 cm. long, 3 to 4.5 mm. wide, obtuse, glabrous. Scape 25 to 30 cm. long and 2 to 2.5 mm. thick, glabrous. Spathe-valves ovate-lanceolate, acuminate, 5 to 10 mm. long. Umbel 5 to 7-flowered. Pedicels 5 to 8 mm. long, glabrous. Perigone-tube 4 mm. long and 3.5 mm. in diameter, bell-shaped. Segments 3 mm. long, about 2.5 mm. wide, oblong, acute. Corona large, 3 mm. long, crenulate or shortly trilobed, orange-red.

This species is related to *T. Ludwigiana*, Harv. It is a native to Cape Colony, Queenstown Division, in the mountains near Queenstown at 1200 to 1300 meter elevation. Galpin nr.1660.

6. TULBAGHIA ACUTILOBA, Harv., Thes. Cap. t. 180. 1854-1863; Baker, Journ. Linn. Soc. 11:371, 1871.

Description.—Roots with several fleshy fibers, corm surrounded by brown membranous scales, ampullaeform. Leaves 4 to 6, linear, more or less firm, 10 to 15 cm. long and 2 to 4 mm. wide. Scape 1.5 to 3 cm. long, slender, terete. Umbel composed of 2 to 6 flowers. Spathe-valves lanceolate, green. Pedicels 0.6 to 2.5 cm. long. Perigone 8 mm. long; tube oblong, greenish. Segments as long as tube, lanceolate. Corona ring-shaped, 30 mm. long, crenate, dark purple. Longest stamens reaching entrance of corona.

Distribution.—Native to South Africa. Table Mountain, Ecklon nr.94. Stock-stroom Div. Katberg, 1000 to 1300 meter, Drege, nr.1516. Near Somerset East, 1000

meters. MacOwen nr. 1582. Tembuland; near Gatberg, 133 meter, Baur nr.736. Natal; near Burban, Wood nr.43. Inan, Wood nr.173, and numerous other localities.

Baker distinguishes two varieties: *T. acutiloba* var. *Curta*, Baker, with shorter perigone-segments, not more than 2 mm. long; *T. acutiloba* var. *major*, Baker, which is more robust than the type. Peduncles about 45 cm. long, leaves 30 cm. long or more, numerous.

7. TULBAGHIA LEUCANTHA, Baker, Dyer Flora Capensis. 6: 404-405, 1896-1897.

Description.—Corm globose. Roots long and fibrous. Leaves 5 to 7, linear, glabrous, 12.5 to 15 cm. long and 2 to 6 mm. wide. Scape slender, often longer than the leaves. Flowers in groups of 3 to 6 in each scape; pedicels 1.2 to 2 cm. long. Perigone 8 mm. long, whitish, segments linear; tube oblong, almost as long as the segments. Corona crenate, about as long as the lobes of the perigone.

Distribution.—Native to the Kalahari Region: Transvaal, Bosch Veldt, between Kleinsmit and Kamel Poort. Rehmann nr.4892. Eastern Region: Griqualand East; Zuurberg, at an elevation of 1200 meters, Mac Owan and Bolus Herbarium. Norm Aust. Afr. 1208. Tyson. Natal: Umzinyate Falls, Wood nr. 1200 near Tugula River, Wood nr.4408.

8. TULBAGHIA KARASBERGENSIS, Glover, Flow. Plants and Ferns collected on the Great Karasberg. Ann. Bolus Herb. 1:104, 1915.

Description.—Corm globose. Neck membranous, 2 to 3 cm. long. Leaves 4 to 7, lanceolate, obtuse, glabrous, 13 to 24 cm. long and 3 to 5 mm. wide. Peduncles slender, 20 to 25 cm. long. Umbel carries 7 to 12 flowers. Spathe-valves ovate, acuminate, membranous. Pedicels about 3.5 cm. long. Perigone green, tube 6 to 7 mm. long. Perigone-segments linear-lanceolate, acuminate, 8 to 10 mm. long. Corona round, yellow, 3 mm. wide. Capsule oval-oblong, 1 cm. long, 6 mm. in diameter.

Distribution.—Native to Central and Eastern Karasberg, Krai Kluft. Of frequent occurrence between stones not far above the bed of the stream. nr.8192. Naradus Sued nr.8234. *T. karasbergensis* approaches in many characteristics those of *T. acutiloba*. It differs by its larger and differently shaped corm. Also the perigone segments are more acuminate.

9. TULBAGHIA GALPINII, Schlechter, Decades plantarum novarum autro-africanum. Journ. Bot. 35: 282-283, 1897.

Description.—Corm unknown. Plant small, reaching a height of 10 to 15 cm. Leaves 5 to 6, erect, linear, obtuse, base dilated, glabrous. Scape slender, glabrous. Spathe-valves narrow, membranous. Pedicels filiform, 0.3 to 0.8 cm. long. Perigone purple. Tube ovoid, 5 to 6 mm. long and 3 mm. wide. Segments linear-lanceolate, acute. Anthers ovate. Ovary sub-globose, glabrous. Style 1 to 1.5 mm. long. Stigma sub-capitate.

Distribution.—This species has been described from Andriesberg at an elevation of 2000 meters. E. A. Galpin nr.2179.

This species differs from *T. violacea* in the distinctly narrowed perigone-tube, ovoid toward apex, and in the more purplish flowers. It resembles *T. acutiloba* but differs from it in the separate corona-scales.

10. TULBAGHIA DIETERLENII, Phillips, Flora of the Leribe Plateau and Environs, Ann. South Afr. Mus. 16:300-301, 1933.

Description.—Corm with many thick, fleshy roots. Leaves 5 to 7 and 10 to 18 cm. long, 1 to 1.5 cm. wide, linear, obtuse; leaf-sheath membranous, glabrous. Peduncle 20 to 35 cm. long, 2 to 3 mm. thick, terete, narrower toward the top. Spathe-valves 1.5 cm. long, 4 to 4.5 mm. wide, glabrous, ovate, long, acuminate, membranous. Flowers 4 to 6 to each inflorescence. Pedicels 6 to 25 mm. long, terete, glabrous. Perigone-tube 5 mm. long, bell-shaped, glabrous, segments 5 mm. long and 3 mm. wide, oblong, obtuse, 3-veined, glabrous. Corona entire, 3 mm. long, with an undulating margin. Stamens sessile, the upper reaching to outside of corona; anthers 2 mm. long and 1.5 mm. wide, oblong. Ovary 1.5 mm. long, 2 mm. wide, suborbiculate in outline. Style 5 mm. long and 1 mm. wide. Stigma about 1.75 mm. broad, capitate.

Distribution.—Leribe, December, A. Dieterlen, 361. The distribution of this species is endemic. In Sensuto the plant is called "Sefotha-Sefotha" which means scent from a distance. Plants are cooked with *Pisosperma capense*. The infusion is drunk to rid the body of an imagined snake which has been brought by the witchcraft of an enemy. Some natives use the herb to increase the strength of to-

bacco. The scent of garlic in this species is very strong and it is therefore not used as food as in the case of *T. acutiloba*.

T. Dieterlenii is very closely related to *T. acutiloba*, Harv., from which it differs mainly by the obtuse lobes of the perigone.

11. *TULBAGHIA HYPOXIDA*, Smith, Rees. Cyclop. 1819. Baker. Jour. Linn. Soc. 11:370, 1871.

Description.—Leaves linear, 25 to 30 cm. long and 4 to 6 mm. wide. Scape 30 cm. long. Umbel carries 6 to 8 flowers. Pedicels 1.2 to 2.5 cm. long. Perigone 1.2 cm. long. Segments as long as the tube, linear. Corona subentire, not more than a quarter of the length of the perigone-segments, annular in shape.

Distribution.—This species is native to South Africa. No special locality is being given. The type specimen is in the Smithian Herbarium.

12. *TULBAGHIA ALLIACEA*, Linn. fil. Ejus. Suppl. Plant. 193, 1794; Thunb., Prodr. Plant. Cap. 60, 1794; Thunb., Flor. Cap. edit. Schult. 306, 1823; Baker, Journ. Linn. Soc. 11:371, 1871; *T. AFFINIS*, Link., Enum. Plant. 1:310, 1821; Roem. et. Schult., Syst. Veg. 7:994, 1833-1850; *T. BRACHYSTEMMA*, Kunth., Enum. Plant. 4:483, 1833-1850.

Description.—Corm globose with fleshy root-fibers. Outer leaves brown, membranous. About 6 to 8 leaves, erect fleshy, 15 to 45 cm. long, 4 to 8 mm. wide. Scape terete, 30 to 30 cm. long, fragile. Umbel carrying 6 to 10 flowers. Pedicels 2.5 to 5 cm. long. Spathe-valves membranous, ovate to ovate-lanceolate. Perigone 8 mm. long, greenish. Segments half as long as the tube, lanceolate. Corona ring-shaped, shorter than the segments of the perigone, purplish-brown to yellow. Upper stamens reach as far as the corona. Capsule ovoid, 1.2 cm. long.

Distribution.—Native to South Africa. Malmesbury Div.; Groene Kloof, 100 meter, Bolus nr. 4347. Cape Div.; Muizenberg, 330 meter, Bolus nr. 4649. Albany Div. Cooper nr. 3279. Stockstroom Div.; Katberg, 1000 to 1300 meter. King Williamstown Div.; Keiskamma, Transvaal Hills near Pretoria, 1300 meter; McLea Herb. Bolus nr. 3091. Natal, Sanderson nr. 429. Inanda, Wood nr. 257.

Baker remarks that the plants have usually a strong scent of onions, but in a plant grown by a Mr. Elwes this scent was entirely wanting.

13. *TULBAGHIA CAMERONI*, Baker, Description of New and Little Known Liliacea, Journ. of Bot. 16:321, 1878.

Description.—Corms and leaves unknown. Scape 15 cm. long, slender. Spathe-valves lanceolate, membranous, 2.5 cm. long. Umbels composed of 3 to 4 flowers; pedicels 1.2 cm. long, filiform. Perigone whitish, 1.3 cm. long: tube 6 mm. long, oblong. Lobes of perigone lanceolate, white and red-brown. Corona bell-shaped, sub-entire, 2 mm. deep to the base of the inner segments, 4 mm. to the base of the outer ones. Ovary sub-globose, 4 mm. long. Style not exerted from the corona.

Distribution.—Is reported to occur along the banks of Lake Tanganyika. Baker stated: "Now Cameron has found this species far within the tropical limits, and Dr. Welwitsch another in Angola."

14. *TULBAGHIA HOCKII*, De Wild., Decades Nov. Spec. flor. Katang, viii-xi. in Fedde Rep. Spec. Nov. Reg. 11:545-547, 1912.

Description.—Corm fibrillous. Neck membranous. Leaves 3 to 4, linear, 13 to 14 cm. long, 5 mm. wide. Apex rounded off, glabrous. Scape 25 to 27 cm. long, slender. Spathe-valves 1.5 cm. long. Umbel 7 to 12-flowered. Pedicels slender, about 28 mm. long. Perigone 7 to 9 mm. long. Segments lanceolate, as long as the tube. Corona cylindrical, margins irregularly dentate.

Distribution.—Native to the Upper-Katanga. Elizabethville. Nov. 1911. (Ad. Hock). This species is said to be related to *T. CAMERONI*.

Subgenus 2. OMENTARIA Baker

15. *TULBAGHIA VIOLACEA*, Harvey, Bot. Mag. t. 3555, 1837; Kunth Enum. Pl. 4:485, Baker, Journ. Linn. Soc. 11:372, 1871; Thiselton-Dyer, Flor. Cap. 6:407, 1896-1897.

Description.—Rudimentary basal leaves brown. Leaves 4 to 7, bright green, 15 to 20 cm. long and 6 to 7 mm. wide, linear-ensiform, somewhat grooved, obtuse, glabrous, coriaceous. Scape 30 cm. long or more, erect, slender, glabrous, narrow.

Umbel composed of 7 to 9 flowers. Spathe-valves membranous, wrinkled, purple tinted, acute. Flowers more or less erect, purple. Peduncles as long as perigone tube, slender. Outside of the perigone salver-shaped; tube 1.8 cm., perigone-segments linear, obtuse, as long as tube. Inner segments, short, oblong, obtuse or emarginate, sometimes bifid. Stamens clearly in two cycles; filaments adnate to the tube. Ovary ovate, short, 3-celled, six-furrowed. Ovules many. Style short, cylindrical, more or less angled, one-third as long as tube. Stigma obtuse.

Distribution—Coast Region: Post Elizabeth, E. S. C. A. Herb. nr. 262. Albany Div.; Bothas Hill, Mac Owan nr. 914. King Williamstown Div.; Keiskamma Hoek, Cooper nr. 544. Central Region: Albert Div.; by the Orange River, Burke. Eastern Region: Kaffrarian Mountains Mrs. Barbar nr. 41.

Baker in Thiselton-Dyer, *Flora Capensis* recognised two varieties e. g.—

T. violacea var. *minor*, Baker, peduncle 10 to 12.5 cm. long; umbel 3 to 6-flowered; pedicels very short, perigone-segments lanceolate, more than half as long as tube.

T. violacea var. *obtusa*, Baker, segments of the perigone-limb oblong, obtuse, 3 to 4 mm. broad. Syn. *T. cepacea* var. *robustior*, Kunth., Enum. Pl. 4:484.

16. TULBAGHIA NATALENSIS, Baker, Gard. Chron. 3 Ser. 9:668, 1891; in Thiselton-Dyer. *Flora Capensis*. 6:405, 1896-1897.

Description—Leaves 6 to 8, bright green, linear, 15 to 30 cm. long and 8 mm. wide, appearing during flowering time. Scape terete, 30 cm. long or more. Umbel composed of 6 to 10 flowers; spathe-valves lanceolate, 2.5 cm. long. Pedicels 6 to 12 mm. long. Perigone white. Tube bell-shaped, 3 to 4 mm. long. Segments obovate-cuneate, longer than the tube. Corona greenish-white, longer than the perigone-segments, slightly crenate, or deeply lobed. Anthers reaching to about half way to the corona.

Distribution—Native to Natal. A plant was received at Kew by Mr. J. M. Wood from the Natal Botanic Garden.

In general habit this species seems to approach closely that of *T. violacea*, Harv. The segments of the perigone are, however, longer than the tube.

17. TULBAGHIA FRAGRANS, Verdoorn, Flow. Plants of South Africa. 11: pl. 438, 1931; *T. pulchella*, Barnes non Avé-Lellemant, South Afr. Gard. & Country Life. 20: 185. illus. 1930; *T. Daviesii*, Gray. 1938.

Description—Corm ovoid, 5 to 6 cm. long and 3 to 3.5 cm. broad. The neck of corm 10 cm. long. Leaves 5 to 7, lorate, flaccid, 25 to 30 cm. long and 2 cm. broad. Scape 50 to 60 cm. long, smooth, compressed, 1.1 cm. wide, purplish green. Spathe-valves membranous, 1.5 cm. long. Flowers 30 to 40, sweet scented. Pedicels 2 cm. long. Perigone-tube 8 to 10 mm. long, segments 6 to 8 mm. long, mauve. Corona of similar color. Stamens sessile, three attached to the long corona-tube and the other three to the tube of the corolla. Ovary 3 mm. long, 6-grooved. Style 2 to 2.5 mm. long. Stigma small, capitate.

Distribution—Native to Transvaal; Lydenburg District, on the farm Dientje below the Treur and the Blyde Rivers. National Herbarium Pretoria Calliers nr. 8894.

Notes.—Dr. R. A. Dyer (HERBERTIA 6:8. 1939) states that this species “has been cultivated under the name *T. fragrans* and in [other gardens] as *T. pulchella*, but the former is the first valid name for the species.” He also points out that this attractive species “has a very pleasant perfume instead of the strong garlic smell usually associated with species of this genus.” In order to complete the record, the description by Barnes is also given:

TULBAGHIA PULCHELLA, Barnes non Avé-Lallemant, Plants New and Noteworthy, South Afr. Gard. and Country Life. 20:185, illus. 1930.

Corm oblong, surrounded by two or more fleshy, glabrous leaves. Neck membranous. Leaves 10 to 12, glabrous, more or less glaucous, 30 to 35 cm. long, strap-shaped. Leaves appear in the spring and are present during flowering. Scape about 40 cm. long, glabrous, glaucous. Umbel 20 to 30-flowered. Spathe-valves lanceolate, membranous. Pedicels about 4 cm. long, green. Perigone bright lilac, 1.4 cm. long, tube 7 to 8 mm. long, oval. Perigone-segments ovate-lanceolate, obtuse, 3 to 4 mm. long. Corona ring-shaped, lilac, 3 mm. long, two-cleft. Stamens above the corona. Style 2 mm. long. Capsule 3-angled. Seeds numerous, black and compressed.

Specimens were sent by Mr. C. N. Knox-Davies from Eastern Transvaal, Pilgrims Rest. Barnes states: "It is an exceptionally beautiful species, similar in the colour of its perianth to *T. violacea*, but differing widely in corona and leaf. In the shape of the corona it is nearest to *T. violacea*, but differs considerably in detail."

18. *TULBAGHIA CEPACEA*, Linn. fil. Ejus. Suppl. Plant. 194, 1781; Thunb., Prod. Plant. Cap. 60, 1794; Thunb. Flor. Cap. ed. Schult. 306, 1823; Willd. Spec. Plant. 2:34, 1797; Kunt. Enum. Plant. 4:484, 1833; Baker, Journ. Linn. Soc. 11:372, 1871; *Ontaria cepacea*, Salisb., Gen. Plant. 88, 1866.

Description—Basal leaves brown, membranous. Leaves 4 to 6, linear, 10 to 20 cm. long, 2 mm. wide. Scape 30 to 45 cm. long. Umbels 6 to 12-flowered. Spathe-valves lanceolate, lilac-tinted. Pedicels 6 to 10 mm. long. Perigone lilac, 1.2 cm. long. Perigone-segments oblong lanceolate, as long as tube. Tube 1 mm. in diameter, cylindrical. Corona lobes clearly visible to the base. Higher stamens situated in the tube near the throat.

Distribution—Native to South Africa. Uitenhage Div.; Van Stadens Berg, Burchell nr. 4741, Ecklon and Zeyher nr. 645. Also along arid situations in Kanna-land and Hantam. Thunberg Herb.

Species NOT CLASSIFIED under Subgenera

19. *TULBAGHIA CALCAREA*, Engler et Krause, Liliaceae Africanæ II., Engler Bot. Jahrb. 45:142, 1910.

Description—Bulbs subglobose, 1.2 to 1.8 cm. in diameter. Leaves glabrous, linear, obtuse, 1 to 2 dm. long or more, and 2 to 2.5 mm. wide. Scape 4 dm. long. Spathe-valves 1.8 to 3 cm. long. Flowers 1 cm. long, corona 2.5 to 3 mm. long. Fruit ovoid, 8 mm. long and 4 to 5 mm. in diameter. Flowers from November to December.

Distribution—Reported from South West Africa near Grootfontijn, between lime stone. Dinter nr. 761 and 761-a.

20. *TULBAGHIA TENUIOR*, Krause et Dinter, Liliaceae Africanæ II. Engler Bot. Jahrb. 45:141-142, 1910.

Description—Bulbs about 2.5 cm. long and 2 cm. in diameter. Leaves 2 dm. long and 1.8 to 2.5 mm. broad. Scape about 2.5 dm. long. Spathe-valves whitish, tinged with violet, 2 to 2.5 cm. long. Flowers light reddish brown, 1.8 to 2 cm. long. Flowers in December.

Distribution—Native to South West Africa, near Grootfontijn along lime rocks. Dinter nr. 790.

21. *TULBAGHIA LUBBERTIANA*, Engler et Krause, Liliaceae Africanæ II. Engler Bot. Jahrb. 45:142, 1910.

Description—Bulbs ovoid or globose about 2 to 3 cm. thick. Leaves glabrous, linear, 2 to 3 dm. or more in length, and about 3 mm. wide. Scape 4 dm. long, 5 to 7-flowered. Spathe-valves membranous, 2 to 2.5 cm. long; pedicels 2 to 4 cm. long. Capsules 6 to 8 mm. long and 4 to 5 mm. wide. The flowers of this species have not been found. The authors consider this plant important enough to elevate it to specific rank due to its peculiar irregular leaves. It is probably related to *T. alliacea*.

Distribution—Reported from South West Africa. Luebbert nr. 44. No special locality is given.

22. *TULBAGHIA BRAGAE*, Engler, Die Pflanzenw. Ost. Afr. u. d. Nachbarg. Theil C 141, 1895.

Description—Leaves narrow, linear, obtuse. Bracts lanceolate, acuminate, pedicels as long as the flowers. Tube two-thirds as long as the flowers; corolla segments linear, acute. Corona urceolate, orange. Outer stamens as long as the corona.

Distribution—Native to East Africa. 20 (Beira-Braza.).

23. *TULBAGHIA PAUCIFLORA*, Baker, Lilaceae novae Africanæ australis herbarii regii Berolinensis., Engl. Bot. Jahrb. Beibl. nr. 35:5, 1892.

Description—Corm small, oblong, 6 mm. in diameter. Leaves 5 to 6, filiform, glabrous, slender, 5 to 7 cm. long. Scape 5 to 7 cm. long, sometimes two from one corm. Umbels 1 to 3-flowered. Spathe-valves 6 to 8 mm. long, lanceolate. Pedicels

6 to 12 mm. long. Perigone-tube 4 mm. long, segments oblong sometimes linear, as long as the tube, white with a brown keel. Corona short, entire. Style very short. Capsule globose, 4 mm. in diameter.

Distribution.—Native to South Africa, no special locality is given. The type specimen is in the Herbarium at Berlin. C. B. Spei. (Ecklon et Zeyher, Hemerocall 6 !)

24. *TULBAGHIA MONANTHA*, Engler et Gilg, Kunene—Sambesi Expedition. 192-193, 1903.

Description.—Corm about 2 cm. long and 1.2 cm. wide. Leaves 5 to 7, narrow, linear or linear-filiform, glabrous, 13 to 15 cm. long and 1 to 1.8 cm. wide. Scape 11 to 12 cm. long. Spathe-valves elongated. Flowers 12 mm. long, tube 6 to 7 mm. long, corona 2 mm. wide.

Distribution.—Along the Kubango, within Kabinder. In loamy sandy soil under shrubs. (nr. 351-a) Flowers in October.

3. CONCLUSION

We have come to the end of this general review of the genera *Agapanthus* and *Tulbaghia*, that are found along the margins of two important families, namely the *Liliaceae* and *Amaryllidaceae*. With keen insight Hutchinson (1934) undoubtedly placed these genera closer to their nearest relatives. It might be well to note, in this connection, the statement of the late Sir Arthur W. Hill, Director of the Royal Botanical Gardens at Kew in the foreword of above work—"Though the treatment of these two families may arouse some controversy among the more conservative taxonomic botanists, it is, I believe generally felt that the present *Liliaceae* is not a very natural family. The revision of the two families, therefore, is all the more welcome," which is also our credo.

THE BRUNSVIGIEAE¹

HAMILTON P. TRAUB

The group under consideration was first recognized in embryo by Pax (1887) as Subtribe *Amaryllidinae* of his Tribe *Amaryllideae*. He admitted the genera *Nerine*, *Amaryllis* Aiton et Herbert non Linn. (now recognized as a synonym of *Brunsvigia* Heist.)², *Brunsvigia*, *Vallota*, *Anoiganthus* and *Ungernia*. In a revision of this Subtribe by Pax & Hoffman (1930) no important changes were made. This grouping of the genera is artificial, but it can be said that at least the first three of the six genera as recognized by him are closely related. This makes it possible to salvage the group. Of the remaining three genera, none are closely akin to the first three. *Vallota* and *Anoiganthus* are closely relatives of *Cyrtanthus*, and *Ungernia* is allied to the Genus *Lycoris*. A number of genera—*Crinum*, *Ammocharis*, and *Buphone*—that are allied to the first three genera listed above, were left elsewhere among strangers. *Crinum* and *Ammocharis* were placed by Pax under the Subtribe *Crininae* along with *Chlidanthus* and *Cyrtanthus*, thus creating a very artificial group. Later Pax & Hoffman (1930) placed a new genus *Stenolirion* (now recog-

¹ This is abridged from Chapter 12, The *Brunsvigia* Tribe (Tribe 6. **Brunsvigieae**) of the writer's manuscript monograph on the **Amaryllidaceae**. It is published in this abridged form at the request of members interested in this group.

² See Hannibal, L. S. *Callicore* and *Brunsvigia*. *Herbertia* 9:101-102, 146. 1942 (1943).

nized as a synonym of *Ammocharis*), under the Subtribe *Crininae*. *Buphone* was placed under the Subtribe *Haemanthinae*.

Hutchinson (1934) elevated Subtribe *Amaryllidinae* Pax to higher rank—Tribe *Amaryllideae*—and admitted the same genera as those recognized by Pax (1887), excepting the genera *Vallota* and *Anoiganthus*. The latter appears nowhere in Hutchinson's arrangement, and *Vallota* was transferred to the Tribe *Crineae* (Pax) Hutchinson which also included the Genus *Cyrtanthus*. This was a slight improvement, but *Crinum*, *Stenolirion*, *Ammocharis* and *Buphone* were still left among strangers.

The Tribe *Amaryllideae* (Pax) Hutchinson, as recognized by Hutchinson (1934) evidently overlapped with the Tribe *Crineae* (Pax) Hutchinson. At least two genera appear under both tribes according to the artificial key of Hutchinson (1930). This indicated that the two tribes had not been critically considered from the standpoint of phylogeny. This led Traub (1938) to propose a reclassification of all members of these two tribes, as recognized by Hutchinson (1934), on the basis of seed structure—seeds subglobose to globose, Tribe *Callicoreae* Traub [syn. Tribe *Amaryllideae* (Pax) Hutchinson] as contrasted with seeds flat, usually winged, Tribe *Cyrtantheae* (Herbert) Traub [syn. Tribe *Crineae* (Pax) Hutchinson]. This reclassification brought together under the Tribe *Callicoreae* Traub the genera *Stenolirion*, *Crinum*, *Ammocharis*, *Callicore*, *Brunsvigia* and *Nerine*. Uphof (1938) had shown that *Amaryllis* Aiton et Herbert non Linn., was a synonym of *Callicore* Link, which made it necessary to propose the change in tribal name from *Amaryllideae* (Pax) Hutchinson to *Callicoreae* Traub. The Tribe *Callicoreae* Traub thus includes all of the closely related genera mentioned above, excepting *Buphone*, and therefore constitutes a genuine natural group. It is in line with the grouping of “*Ammocharis*, *Cybistetes* and Allied South African Genera” by Milne-Redhead and Schweickerdt (1939) who list *Ammocharis*, *Cybistetes*, *Buphone*, *Crinum*, *Brunsvigia*, *Nerine* and *Amaryllis* Aiton et Herbert non Linn. (Now recognized as a synonym of *Brunsvigia* Heist.) It should be noted that these workers reduced *Stenolirion* to a synonym of *Ammocharis*; proposed the new Genus *Cybistetes*, and transferred here for the first time the Genus *Buphone*. This family completed the group from the phylogenetic standpoint. These changes and the addition of one genus are accepted in the present work. However, the addition of the Genus *Cybistetes* is tentatively accepted. Space limitations do not permit of a full discussion of this subject.

Herbert (1821) was the first to question the generic status of the provisional Genus *Amaryllis* Aiton et Herbert non Linn. (now recognized as a synonym of *Brunsvigia* Heist.). Worsley (1928), who made a special study of the genera involved, again raised the question. Herbert (1821) had expressed the belief that any differences between this genus and *Brunsvigia* were of questionable value as generic distinctions. Worsley (1926, 1928) presented evidence to show that there was apparently gene exchange resulting in fertile hybrids when species of these two genera met under natural conditions. In England, Holland and Australia, in the meantime, a series of beautiful fertile hybrids between species, assigned to the genera under consideration, had been produced. These results

have been summarized by Worsley (1926, 1928), Cowlshaw (1925) and Hoog (1935). This completed the evidence showing the intimate connection between species apparently erroneously assigned to two different genera.

These facts led Hannibal (1943) to propose *Callicore* Link. (syn. *Amaryllis* Aiton et Herbert non Linn.) as a synonym of *Brunsvigia* Heister. This latter genus was founded by Heister in 1853. It bears a valid name that has priority in nomenclature over the former which dates from 1829. This disposition of a provisional monotypic genus—the single species being capable of exchanging genes when its range overlaps with species of another genus—is apparently justified on the basis of the evidence presented. The gap between them is not sufficiently great to warrant two separate genera. We agree with the tentative definition of a genus proposed by Mayr (1942)—“A genus is a systematic unit including one species or a group of species of presumably common origin, separated by a decided gap from other similar groups. It is postulated for practical reasons that the size of the gap shall be in inverse ratio to the size of the group.”

Now that the generic name *Callicore* Link has lapsed into synonymy, it is necessary to make a final change in the tribal name. *Callicore* Link has become a synonym of *Brunsvigia* Heister and it is logical to base the new tribal name on the latter Genus. This is particularly fitting for the Genus *Brunsvigia* Heister is now indicated as the nomenclatural generic type of the tribe. The new tribal name, *Brunsvigieae*, is therefore proposed.

The masterly treatment of “*Ammocharis, Cybistetes* and Allied South African Genera” by Milne-Redhead and Schweickhardt (1939) did much to clarify some of the problems in connection with this group, especially in the case of *Crinum* and *Ammocharis*. The important bearings of their work on the delimitation of genera are discussed in detail under the genera concerned.

On account of lack of space, it is not possible to consider in more detail these genera and the others included under the Tribe *Brunsvigieae* in the present brief summary. However, the diagnosis of the Tribe, and the key to the genera, are given in some detail in order to indicate the scope of the Chapter.

Tribus 6. BRUNSVIGIEAE, Traub, *nom. nov.*

Amaryllidinae (subtribus), Pax, Engl. Nat. pfl.-fam. II (5); 105-106.1887; Pax & Hoffman, Engl. nat. Pfl.-fam. 15a, 2 auf. 1930, pp. 404-406; *Amaryllideae* (tribus) Pax et Hutchinson, fam. fl. pl. 1934, vol. II, p. 132; *Callicoreae* (tribus) Traub, *Herbertia* 5:111-113.1938.

Type genus: Brunsvigia Heister

Diagnosis.—Rootstock a bulb, leaves linear to oblong, bilabellately, spirally, or distichously arranged; flowers actinomorphic or zygomorphic; seeds subglobose to globose.

Key to the genera of Tribe 6. Brunsvigieae

A. Leaves distichously or spirally arranged:

B. Ovules numerous per locule:

C. Pedicels not elongating in fruit 34. *Crinum*

CC. Pedicels usually elongating in fruit (includes *Callicore*, Link) 35. *Brunsvigia*

BB. Ovules few per locule:

D. Perigone-segments equal, not crisped, actinomorphic, stamens inserted at throat of perigone-tube, pedicels elongating in fruit 36. *Buphone*

DD. Perigone-segments subequal, more or less crisped, zygomorphic; stamens inserted at base of perigone segments, pedicels not elongating in fruit 37. *Nerine*

AA. Leaves biflabellately arranged:

E. Perigone actinomorphic 38. *Ammocharis*

EE. Perigone zygomorphic 39. *Cybistetes*

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BRUNSVIGIA ROSEA AND HYBRIDS

L. S. HANNIBAL, *California*

The South African "Cape Belladonna Lily," *Brunsvigia rosea** established itself in a very congenial home with the colonization of California in the middle of the last Century. The sources of the original types introduced are quite unknown. They may have come from cultivated stock grown in the Mediterranean area since there is much similarity between plants from that area and our very common early flowering variety *major* and a pale rose type which flowers somewhat later (See HERBERTIA: 159-160. 1941). It was generally accepted that these clonal forms, and a *rubra* type known as *Minor*, represented the sum total of our older garden importations, but the discovery of two other distinctive types recently in old gardens about San Francisco Bay attracted some interest in the nomenclature of these attractive plants. Subsequent attempts to identify these clones which one would assume as simple soon proved otherwise. Few of the horticultural types have been completely described—No monograph exists, and at best only a few widely scattered reports are available; the oldest dates back to 1755. None of these offered much aid in the original problem of identification of the local types. Extended correspondence with several West Coast members of the A. A. S. indicated that although several other forms of the "Cape Belladonna" existed their nomenclature was uncertain or very vague.

Believing a check list would be of value the writer then undertook to locate as much general data as available on the clonal types and hybrids of this interesting species and its relatives. This involved the examination, partly by the use of bibliofilm, of many early descriptions and bits of historical data which are now seldom available. To make the survey up to date, clones listed in catalogues of a half dozen foreign firms and as many firms as could be found in the U. S. A., were included. Van Tubergen's newer 1940 presentations are listed although no record of a number of these reaching the public can be found—We hope that they may survive in spite of the European chaos.

The tracing of the horticultural types by early description is indeed perplexing, but is understandable when one realizes that few writers checked their living specimens closely with earlier references or preserved type specimens, and names had been confused repeatedly. Historically the original bulbs were introduced into Portugal some time before 1700—Possibly in 1510 during their conquest of Goa in India. In Portugal, the plants became associated with religious festivals. In 1712 the London Horticultural Society imported several bulbs from Maderia and as they gained in popularity, Miller illustrated the plant

* *Brunsvigia rosea* (Lamarck) Hannibal; syn: *Callicore rosea* Link; *Amaryllis belladonna* Aiton et Herbert non Linn. See Herbertia pp. 101-102; 146. 1942. See also "The Genus Amaryllis," R. H. S. Journal 57, pp. 8-14. 1932. The name *Brunsvigia rosea* supersedes the synonyms and will be used throughout this report. The accepted common name is "Cape Belladonna." To distinguish between *Brunsvigia rosea* and those plants previously alone classed as *Brunsvigia*, the name *Eubrunsvigia* (subgenus) will be applied to the latter, and *Callicore* (subgenus) to the former, when referred to collectively.

and described its culture in his Gardener's Dictionary of 1755. Since it was already called the "Belladonna" in Portugal he assigned this name to it but stated that it did not coincide with the *Amaryllis Belladonna* Linn. (syn. *Hippeastrum equestre* Herb.) from the American Indies. Miller's plant was a *rosea* type having a fine penciling of light red in the perianth. Purple shadings in the throat were also quite common since numerous seedlings were raised and some variation was present. Van Royen of Leyden introduced a *pallida* type from the Cape in 1754, and Sir Joseph Banks also brought in a pale form which was less hardy than the *rosea* variety. *Blanda*, a distinct type, which Mr. Hibbert had in his collection, was never widely distributed although it seems that Dean Herbert produced some crosses with it that later appeared in France. The original plants in Portugal also spread to Italy and France, and either by chance or selection, seemed to have been more of the rose-purple in contrast to the English forms. As all of the early writers used whatever material they had available to illustrate the plant it is natural that some appreciable variation in form, type, and color exists in the various illustrations. Since Herbert's time, with the introduction of *Brunsvigia* hybrids, a new field of hybridization was opened up giving numerous new forms. The names of Bidwell, Sir Henry Parker, Van Tubergen, and Arthington Worsley will long be associated with this interesting race which is quite distinct from the intra-specific forms.

Although the writer could not obtain specimens or detailed taxonomic descriptions for all the clones listed in the check list, an attempt has been made to group them according to the outstanding characteristics as one would with the hybrid daffodils. This grouping should therefore be accepted as only tentative. Obviously some clones may be misplaced or apparently misnamed, for old names are often affixed to new or improved clones. This list should therefore serve as a starting point for further checking. One should continually bear in mind that color descriptions can be quite misleading as strong light tends to produce lighter shadings. Thus noticeable variation is evident for bulbs grown in Australia, England, South Africa, or California where latitude and climatic conditions are so divergent.

As an additional feature, the *Brunsvigia* inter-specific hybrids, and the *Crinum* F-1 bigeneric forms, were examined. If it were not for the work of Worsley much confusion would exist in the literature regarding the identity of the inter-specific *Brunsvigia* hybrids of which two general types apparently exist; those that are crosses of *Brunsvigia gigantea* (Van Marum) Traub (syn: *B. Josephinae* Redouté) on the *Brunsvigia rosea* which produce the *Parkeri* type of hybrids, and the crosses of *B. orientalis* Linn. (syn: *B. multiflora* Ait., or *B. gigantea* Heist.) which gave rise to the Bidwell "Multiflora" hybrids. Other species of *Brunsvigia* may have been used by Bidwell, at least he used the pollen of several. The literature contains no record as to the types of *Brunsvigia rosea* parentage used by any of the hybridizers, but this is not important since the "Parkeri" and "Multiflora" forms are the selection of the best from numerous crosses where many wide variations or breaks are

possible. The type of selected parents used in subsequent crossings is of far more importance and many F-2 and later segregates possess qualities which far exceed those of the original clones. However this progressive improvement is not so readily obtainable if one reintroduces common *Brunsvigia rosea* pollen.

It is only within the last few years that any of these hybrids arrived on the Pacific Coast, but at present a limited supply is available. The forms best known here are the "*Parkeri Van Tubergeni*" types which vary from light rose to white, and several white "*Bidwell Multiflora*" clones. So far, none of Sir Henry Parker's crosses have been recognized here with the exception of a clone that resembles *Kewensis*, although there may be a possibility that *Brunsvigia rosea* var. *minor* may belong to this group.

Van Tubergen was the first to propose the name "*Brunsdonna*" for his hybrids in 1906. Worsley favors the use of this name for all hybrid crosses and refers to them as "Garden Brunsdonnas" in contrast to "Garden Cape Belladonnas" which applies to *Brunsvigia rosea* forms supposedly of non hybrid stock. Since Worsley's reports are so complete, it is quite easy to trace the source of all but a few of the hybrids of which he thought so much. In several of his later writings (Gard. Chron. 84, 1928, p. 349; abstr. HERBERTIA: pp. 99-100. 1942.) he had suggested that this group was not of bigeneric origin since Dean Herbert had effected crosses both ways between several *Brunsvigia* and the "Cape Belladonna" and had seen no reason for two genera. Worsley also gave examples of hybrids having been found in the wild, and described several forms that are barely distinguishable from supposedly non-hybrid segregates.

In F-1 hybrids with *Brunsvigia gigantea* (syn. *B. Josephinae*) that have been secured both ways, those with *B. gigantea* seed parentage are very dissimilar from those raised on the "Cape Belladonna." The former resemble *B. gigantea* in form and are of slow growth, taking 15-30 years to flower, while the latter resemble *B. rosea* in structure, and flowers in 6 to 12 years, thus perplexing those who consider that whichever way a hybrid is raised it must bear the same name. This behavior and the ease of effecting these crosses where the offspring are entirely fertile at once raises the moot question as to just what constitutes a genus and what are its limitations. The bigeneric cross of *Crinum Moorei* on *Brunsvigia rosea* has long been known. The *Crinum* characteristics are seemingly dominant as sterile crinum-like offspring are always produced, representing what we should expect of a bigeneric offspring. But should the two genera discussed above (*Brunsvigia* and *Callicore*) which produce fertile offspring, be placed in separate genera? In 1837 Dean Herbert wrote that "No plants which interbreed can belong to separate genera" (HERBERTIA, 4, 1937. P. 37).

Brunsvigia rosea is apparently more closely related to the *Crinum* species of the Subgenus *Codonocrinum* than to the species classed under the two subgenera *Stenaster* and *Platyaster*. Although crosses between species of the latter two subgenera with those of the Subgenus *Codonocrinum* have been reported, it is doubtful if such are really possible.

The writer has not been able to verify any of these. At any rate the subject needs further investigation. There are a great many species of *Crinum* and only a fraction of them have been used in breeding experiments up to the present.

Morphologically the *Eubrunsvigia*, are semi-tropical in habit. The leaves are few, lingulate, and large; the scape short and thick, and they carry a large umbel of many flowers on long pedicels in an open hemispherical pattern. In contrast *Brunsvigia rosea* (Subgenus *Callicore*) comes from a restricted area about the Cape where the climate is more temperate. It retains some of the *Crinum* characteristics in that the flowers are few on a long scape, and the leaves are channeled and lance tipped.

It should be noted that there is a correlation between bulb sizes and shapes and leaf shape; the variety *major* has a linear leaf 1" wide with a near lance tip. The large, long pseudo-necks of the Bidwell "*Multiflora*" group produce a leaf with a blunt rounded tip, while *Parkeri* parentage which apparently produces very large oval bulbs, has a pointed semi-lorate shaped leaf that is several inches wide. Leaf number apparently varies with the clone and type—Variations from 7-16 leaves having been found among the varieties the writer has observed, but 12-14 seem to be normal for most of the non-hybrid types. Some of the variations in number of leaves and bulb sizes are summarized in the following table.

Leaf and Bulb Variations of BRUNSVIGIA ROSEA clones

Clone:	No. of Leaves:	Bulb Size:
BRUNSVIGIA ROSEA or "Cape Belladonna" types		
Variety <i>Major</i> , The common Calif. garden form)	10-12	Large
Chilean form, (A Chilean escape)	14	Medium
Variety <i>Minor</i> , (Of Carifornia)*	11-12	Small-Globular
Bicolor No. 1, (A seedling of <i>Minor</i>)	12-14	Medium
Bicolor No. 2, [An apogamic (?) seedling of above No. 1]	8- 9	Medium
Hybrid PARKERI types		
Kewensis type (Orpet) "Santa Barbara"	6- 7	Medium
Seedling of Elwe's <i>Rubra</i> , (An Oakhurst hybrid)	11	Very large
Seedling of <i>Minor</i> , (An Oakhurst hybrid)	8	Large
F. Leach's <i>Blanda</i>	10	Large
Hybrid Bidwell BRUNSVIGIA MULTIFLORA types		
<i>Multiflora Rosea</i>	12	Large
<i>Multiflora Haythor</i>	14	Large
<i>Haythor</i> (Possibly from Mrs. Bullard)	13	Large
<i>Baptisii Alba</i>	11	Medium
Orpet White	12	Large
Orpet <i>Multiflora</i> seedling	10	Large

* Possibly a hybrid **Parkeri** type; both this and the Chilean escape have seed stalked on placenta 3 mm. long. Once considered strictly a **Brunsvigia** characteristic, it is quite common in a number of clones, especially the hybrids.

CULTURE

Brunsvigia rosea varieties require a long, warm, dry summer and a moist, cool, near frost free winter for a normal habitat. The East Coast of the United States has never been well suited to their growth, and Florida conditions of wet, humid summers and dry winters are entirely at odds with their requirements. Perhaps the potting of the bulbs in a half nail keg full of loam, as has often been used on the Pacific Coast, could be tried by our A. A. S. friends in Florida, and similar methods could be used in other areas where protection from hard winter freezes or moist summer rains is desirable. At best transplanting should be avoided, for the "Cape Belladonnas" dislike root disturbances and usually take two or three years to reestablish themselves. The custom of planting the bulbs in full sun may also be overdone; in areas where daytime humidity may drop below 30%, part shade is conducive to better leaf growth and flowering.

Brunscrinum Howardii, the *Brunsvigia rosea* X *Crinum Moorei* hybrid, enjoys some moisture in summer and is well adapted to Floridan climatic conditions. The writer suspects that some hybrid *Brunsvigia* may eventually be developed which will also grow and flower under such conditions since several *Brunsvigia* spp. are said to be summer growing, winter resting plants. Unfortunately the required species like *Brunsvigia minor* and *B. Cooperi* seem practically unknown to the U. S. hybridizers; perhaps our South African friends will avail themselves of this interesting opportunity.

Soil conditions for *Brunsvigia rosea* varieties is not critical. Any good loam or clay soil which is suitable for roses is entirely satisfactory for these bulbs, but soils high in sand content may prove too porous. Different soils have little or no effect on color variations for any one clone, but intensity of light is important. Planting depth is likewise not critical; apparently in normal habitat a 2/3 bulb coverage is all that is required. In England the bulbs are planted two feet deep to avoid freezing. The *Parkeri* and other hybrids require a lighter loam and a warmer location. The large size and elongated necks of the Australian *multiflora* hybrids suggest that a shallow planting with a ground cover is advantageous. *Brunscrinum Howardii*, (syn. *Amarcrinum Howardii*) and similar *Crinum* X *Brunsvigia* hybrids in contrast need only the base of the huge bulbs covered, but *Crinum Moorei* parentage makes it advisable that this race receive some mid-day shade in warm areas. The plants have been grown outside at Kew where winter frosts of 15 degrees F. have not harmed the foliage.

REPRODUCTION

The writer has had little difficulty with *Brunsvigia rosea* varieties setting seed. As soon as the stigma raises into a receptive condition, which is 3 or 4 days after the flowers open, pollen should be applied. If the plants are left to themselves, self or cross fertilization usually takes place. The hybrid forms set seed most freely, but this is due to the fact

that these are not inbred pure line strains like the variety *major*, common in California, but not a prolific seed producer. Dry climates are always conducive to effective pollination for coolness and moisture promote the best seed production. About Valparaiso, Chile escape plants have spread by seed over large areas; they have been reported in regions where there are no vestiges of human habitation, but such conditions have not been noticed in California although the plants "self sow" quite readily. Rapidity of offset development and man's love for fine flowers have contributed largely to the distribution here.

Apogamic development of seeds may occur in the case of *Brunsvigia rosea*, but no exact data on this subject have as yet been presented.

The ease of crossing several varieties of *Crinum Moorei* on *Brunsvigia rosea* is interesting. Only two or three varieties out of a score of forms seemingly are capable of crossing, but with these few a distinct "take" can be noted from the first. Growth begins while the seed are still in the capsule. Plants one year old are distinctly crinum-like with bulbs often over an inch in diameter. Reverse crosses with a *Crinum* as seed parent have not been a success here, and there is some uncertainty regarding their existence. Neither have crosses with *Crinum* other than *Moorei* been definitely reported. However there are unquestionably interesting possibilities to be tried by our friends who have *Brunsvigia* and *Crinum* collections, for other forms of the *Brunscrinum* breed would indeed be welcome additions to our gardens.

KEY TO HORTICULTURAL FORMS OF *BRUNSVIGIA ROSEA* AND *BLANDA*, INTER-SPECIFIC,
AND INTER-GENERIC HYBRIDS

A. Species, intra-, and inter-specific hybrids of *Brunsvigia rosea*.
Plants deciduous.*

B. Intra-specific variations and horticultural forms of the subgenus *Callicore*; leaves linear, flowers few (seldom over 12).

C. Plant semi-hardy, flowers white turning suffused pink, leaves wide and sheathed in pseudo-neck 1. *B. blanda*

CC. Plants hardier, leaves linear, up to 1½" wide, no pseudo neck, flower colors as follows; (*Brunsvigia rosea* variations).

D. Colors uniformly blended light pink, pale lavender, or near white, fading slightly with age 2. *Pallida*

DD. Colors to coral red or rose, often deepening with age or not uniformly blended 3. *Rosea*

DDD. Colors same as DD, but set off in contrast to a white throat of large area 4. *Bicolor*

DDDD. Colors purple or lavender, especially in the expanding part of the segments 5. *Purpurea*

DDDDD. Flowers near white or soft pink, color deepening very pronounced with age 6. *Variabilis*

BB. Natural (?) and horticultural inter-specific hybrid forms of subgenus *Callicore* X species of *Eubrunsvigia*; plants often tender to frost, umbel large, flowers numerous and less compact than

CC, leaves often lingulate and sheathed in pseudoneck, mature ovaries large and fruit numerous.

E. Crosses of Spp. Subgenus *Callicore* (Pistillate) X Spp. Subgenera *Eubrunsvigia* (Staminate), i. e. *Corevigia*.

F. With *B. gigantea* (Syn *B. Josephine*) 7. *Parkeri*

FF. With *B. orientalis* (Syn *B. gigantea* of *multiflora*) 8. *Multiflora*

EE. Crosses the reverse of E, i. e. 9. *Brunscore*

AA. Inter-generic hybrids of any *Brunsvigia* Spp. X *Crinum* Spp of subgenus *Codonocrinums* Plants Evergreen.

G. Pistillate parent a *Brunsvigia* 1. *Brunscrinum*

GG. Pistillate parent a *Crinum* 2. *Crinovigia*

* Note; forms DD and DDD were both called **rosea** in the past. The plants of F and FF are often of the same shades and form of C, DD, and DDD and probably should be classed as such, as they often represent segregates approximating these ancestral forms.

1. *Species and intra-specific variations of subgenus Callicore*

1. BLANDA TYPE: a species or natural hybrid with white flowers which turns light pink with age.

Brunsvigia blanda (Gawler): HERBERTIA, pp. 101-102; 146. 1942. *Amaryllis blanda* Gawler: Bot. Mag. plate 1450, 1812. *Belladonna blanda* Sweet: Hort. Brit. 2nd. Ed. p. 506. *Cobergia blanda* Herbert: Curt. Bot. Mag. pp. 1-50, 49, 1822. *A. blanda* Herbert: Amaryllidaceae pp. 278-279. 1835. *Amaryllis belladonna* var. *blanda* Baker: Handbook of Amar. pp. 96. 1888. Also see Gard. Chron. P. 349. 84. 1928.



Fig. 89. *Brunsvigia rosea*, upper left, var. *major*; upper right, var. *minor*; lower left, var. *Looseriana*; lower right, *Brunsvigia* hybrid, Frank Leach.

This clone which may be a natural *Brunsvigia* hybrid has been lost to garden use since Herbert's time as it proved too tender for outdoor growth. Pending further information it is retained as a species although Worsley is quite convinced that it is a natural cross approximating the present *Parkeri* segregates, several of which he had in his collection. *Blanda* was introduced to cultivation in 1754. Her-

bert considered it distinct due to its wide leaves which are well sheathed in a pseudo-stem or neck. He used it in breeding since several *Blanda* hybrids were listed by continental nurserymen, and also by Montagu of Australia. But the fact that Mr. J. E. Elwes could not locate the true one for his collection suggests that the original clone has long been lost.

2. *PALLIDA* TYPES: Flower colors clear and delicate, uniformly blended with shades from white, or near white, to pink, soft rose, or pale lavender. Umbels compact, mostly fragrant and leaves sheathed in a green pseudo-neck. (All forms of *Brunsvigia rosea* have the leaves sheathed in a pseudo-neck although it is usually very short or obscure. A red-green or reddish pseudo-neck indicates a deeper colored flower.)

(a) *Brunsvigia rosea* var. *pallida*. Syn. *Amaryllis belladonna pallidas* Bot. Reg., t. 714.; *Belladonna pallida* Sweet: Hort. Brit. 2nd Ed., 1830.; *A. b.* var. *pallida* Redoute: Les Lil. t. 479.

This clone has few flowers to the umbel of a pale pink color, bulbs small, leaves slender. Gathered by Sir Joseph Banks in the Cape area.

(b) *VAN ROYAN* VARIATION. Herbert's *Amaryllidaceae*, 1837, P. 277. Curt. Bot. Mag. 19, 1804, t 733. Millers Garden Dict. 1755, Text No. 23, (No Plate)

Sir J. Banks and Van Royen, as well as Herbert, introduced pale forms of *pallida* types from the Cape. One of these forms, which is quite distinct from the *Blanda* of Bot. Mag. 1450, is still occasionally grown. It flowers in Calif. about October 1st. The segments are relatively narrow and the tube is short. It contains a light pink venation of a lighter shade than "Belladonna Major," but cannot be said to be of any outstanding merit. (See Fig. 89; "Chilean Belladonna," a near duplicate.)

(c) *Brunsvigia rosea* var. *Looseriana*. Syn: *Amaryllis belladonna* Looser: Nat. Hort. Mag, 21, 1942, P. 48. "Chilean Belladonna" (common name).

An escape form found about Valparaiso, Chile. An examination of a number of bulbs collected by the University of California Andes Expeditions showed very little variation in this bulb type. The flowers are a very pale pink with white throat and a yellow eye. The perianth segments are exceptionally narrow and quite reflexed. Scape slender and red. Leaf number 14 which is the highest commonly observed. The foliage is narrow and deep green. It breeds true. See Fig. 89.

(d) *Brunsvigia rosea* var. *stricta*. Syn: *Amaryllis stricta*: (Montague Catalogue) Described by Montague as a light pink and white form.

3. *ROSEA* TYPES, including "Cape belladonna" types. Flowers tipped rich coral red or rose, often in marked contrast to a white throat. The colors may deepen appreciably as the flowers age, but the delicate shadings are usually not as uniformly blended as in *Pallida* Types. Scapes often colored red or red-green, and bulbs are sometimes small and globular. Several forms are not very frost hardy. Propagation by offset is usually prolific. Most forms have fragrant flowers but are not all free flowering.

(a) *Brunsvigia rosea* (Lamarck). Syn. *Amaryllis rosea* Lamarck: Dict. Enc. dr. Bot. 1, 1789, P. 122.; *Amaryllis belladonna*. Curt. Bot. Mag. 19, 1804, t 733.; Mrs. Bury's Hexandrian Plants, t. 45.; Trattinicks Thesaurus Bot. 40.; Linn. 2nd. "MS in HERBERTIA, 4, P. 99.; Baker's *Amaryllidaceae* 1888, P. 95.

The type species. Lamarck bases his description on Millers Plate No. 24 and states: "Umbels 2½' high with rather long perfect campanulate flowers of clear purple (?) blending to a white (throat) and a very pretty red (perianth). Flowering in Sept. or Oct." Plate 733 in the Botanical Mag. shows a light purplish-rose shade in the throat and states this plant came from Portugal in 1812.

(b) *Brunsvigia rosea* (Miller), Syn. *Amaryllis belladonna* Miller: Miller's Garden Dictionary, 1755 or 17771 with plates, Vol. 1, P. 15-16, t 23 and Plate 24.; Redoute's Les Liliacees, Vol. 3, t 150. 1806.

Miller's bulbs came from Portugal where it was called "Lilio-narcissus" or "Belladonna." Unfortunately he not only confused this bulb with the *Amaryllis belladonna* Linn. (*Hippeastrum equestre* Aiton) from Jamaica, but placed text 23 with plate 24, whereas text 24 and plate 23 refer to *Amaryllis reginae*. This Portuguese bulb was pink and white, a bit deeper in tones than the common California

Belladonna Major. Redoute's plate is very similar. It is interesting to note that Redoute commented at some length on the fact that this plant was not the *Amaryllis belladonna* of Linnaeus. The text of Redoute's contains an extensive list of pre-Herbertian references.

(c) *Brunsvigia rosea* var. *major*. Syn. *Amaryllis belladonna major*. "Belladonna Major" (Local name).

The common California garden form of Belladonna. Bulbs large, producing many offsets within a few years. Foliage 1½" wide, pseudo neck short. Flowers freely in early August on 30" scapes which are near green in color. Blossoms of soft rose to light lilac-rose shadings blending into a white throat that carries a faint touch of cream-yellow well down in the tube. Foliage vigorous, and hardy to 20 F. The source of this strain is unknown. The lack of variation in the number of selfed seedlings, as with the Chilean clone (2.c) suggests that pure line breeding has led to fixed characteristics. (See Figs. 89 and 90.)



Fig. 90. *Brunsvigia rosea* var. *major*; this variety is widely distributed in California.

(d) *Brunsvigia rosea* var. *elata*. Syn. *Amaryllis belladonna elata*: (Barr Catalogue).

Flowers of deep rose shade on 3' high dark stems blooming in August.

(e) *Brunsvigia rosea* var. *G. H. Frances*. Syn. *Amaryllis belladonna G. H. Frances*: (Montague Cat.)

An Australian form having very deep pink blossoms.

(f) *Brunsvigia rosea* var. *perfecta*. Syn. *Amaryllis perfecta*: (Montague Cat.)

Described by Montague as of dwarf habit, but with large pink and white blossoms.

(g) *Brunsvigia rosea* var. *pudica*. Syn. *Amaryllis belladonna pudica*: Kers. Reg. t 8, f2. *Belladonna pudica* sweet: Hort. Brit. 2nd Ed., 1830.

Flowers rose color. Introduced 1795.

(h) *Brunsvigia rosea* var. *maxima*. Syn. *Amaryllis Belladonna rosea maxima*: (Barr Cat.), Gardeners Mag., 45, P. 303.

Early August flowering form with large deep rose colored flowers; delicately scented; 9-10 blossoms to umbel; Height $2\frac{1}{2}'$, very vigorous.

4. BICOLOR FORMS. Similar to *rosea* but with large showy white throats. The extremes with red tipped perianths are sometimes culled *rubra*.

(a) *Brunsvigia rosea* var. *bicolor* (Sprenger) Syn: *Amaryllis b. Spectabilis bicolor* Sprenger: Gartenflora, 45, Page 358 (Syn: *A. b. s. tricolor*)

The original reference contained a typographical error under the plate which called the plant *A. b. s. tricolor*. October-Nov. flowering with large umbels of marked fragrance, containing numerous blossoms with a rich rose colored (rosen farben) perianth about a white throat. Van Tubergen and Montague describe a type by the same name which is pale pink with large white centers. Are there two clones involved or is the interpretation of Sprenger's "rosen farben" at fault? The writer does not know.

(b) *Brunsvigia rosea* var. *minor*. Syn. *Amaryllis belladonna (rubra) minor*, commonly called "Minor."

Probably a form of *A. b. rubra*. Source not known—but according to Houdyshel possibly from Spain. Common in Calif. previous to 1900 and at present a popular garden form on the West Coast. Several clones exist having small bulbs and narrow almost linear leaves. A 20" scape carries 10-12 flowers of a *bicolor* type with brightly tipped rose perianths set off in contrast from a white throat. The bulbs are not as prolific or quite as hardy as common *rosea* forms. Scape reddish and seed bright rose. Numerous unnamed *bicolor* and *rosea* hybrids have been produced by crossing this clone with other California garden forms. See Fig. 89.

(c) *Brunsvigia rosea* var. *rubra* (Truffout). Syn. *Amaryllis belladonna rubra*: Flores des Serres, t 1415, 14, 1861, P. 53-54. *A. b. mutabilis speciosa purpurea* Truffout.

Six or seven blossoms on a red scape. The individual flowers are very slender and open only slightly. The perianth, which is a rich rose color in contrast to a white throat, resembles the Californian *minor* quite closely.

(d) *Brunsvigia rosea* (Link). Syn. *Callicore rosea* Link: Handbuch Zur Erkennung der Nutzbartsen, etc. Berlin, 1829, P. 193. Syn. *Amaryllis belladonna* Baker.

"Scape red, segments rose colored and reflexed, throat white." Link's description is too limited for close identification but apparently it is a *bicolor*. There is no clue as to the exact form Link had in mind, although the name *rosea* may have come from Lamarck's Dictionary. Baker's type species as described in the handbook, is also pink and white.

5. PURPUREA FORMS: Many of the continental forms and wild clones show a large purple or lavender shaded area in the expanding part of the corolla. In some respects these markings have been considered objectionable and few are found in the trade at present. Planchon's plate is a splendid example.

(a) *Brunsvigia rosea* var. *purpurascenes*. Syn. *Amaryllis purpurascenes* Sweet: Hort. Brit. 2nd Ed. 1830; *Amaryllis belladonna* J. E. Planchon: Flore des Serres, 9, 1853, t. 911.

Flowers of a light purple cast, introduced into garden use from Italy. Numerous variations may exist. The plate in Flore des Serres shows a plant with many blossoms on a green scape. The segments are narrow and quite recurved, and the coloring, which is lavender in the limb in contrast to a wine-pink corolla is entirely distinct from any garden form in California.

(b) *Brunsvigia rosea* var. *purpurascenes* (Ferrari). Syn. *Narcissus Indicus* Ferrari: Florvm Cvltvra 117-118, Plate p. 121, Romae 916330. *Lilio Narcissus Ind.* Barvelius: Plant. per Galliam, P. 70, 1714.

Described as: "Flore Liliaeeo, diluto clore purpurascenes." Purpurea in those days often meant rose; the position of this plant is doubtful.

(c) *Brunsvigia rosea* (Marloth). Syn. *Amaryllis belladonna* Marloth: Flora of So. Africa, 4. P. 125.

A light colored *purpurea* type with bluish throat and reflexed soft pink perianth. Bulb small, 5-10 flowers on a red scape. Stated to be a common form about the Cape. Perhaps this should be classed as a *pallida* due to its light shade.

(d) *Brunsvigia rosea speciosa purpurea*. Syn. *Amaryllis speciosa purpurea*: (Barr Catalogue)

Very rich rose-purple flowers with striking white centers. Height 2½' and flowers in early August.

(e) AYLETT'S HYBRIDS.

Bright wine colored shades developed recently by Aylett on New South Wales. Further information lacking.

6. VARIABILIS FORMS: Flowers open near white or soft pink and deepen in color with age to rose, wine, or purple, especially in the expanding part of the corolla. Scapes red, foliage hardy and plants free flowering.

(a) *Brunsvigia rosea variabilis*. Syn. *Amaryllis variabilis*, common name "Table Mountain Lily" (Montague Catalogue)

Opens nearly white and deepens to ruby red with age. Quite free flowering. The segments are narrow and the plant resembles "minor."

(b) *Brunsvigia rosea perfecta*. Syn. *Amaryllis rosea perfecta*: Gartenflora, 45; Page 442-443.

Satiny-rose flowers with a white throat. Segments narrow, quite reflexed and pointed. As the flowers age the color deepens to a pure rose flaked by fine white granular markings which glint in the sun. Considered a late flowering type. The plate shows it flowering with the foliage developed.

(c) *Brunsvigia rosea purpurea major*. Syn. *Amaryllis belladonna purpurea major*: HERBERTIA, 5, p. 57.; Baileys Cyclopaedia of Hort. (Called *rosea perfecta* in French gardens)

A plant with a very deep pink bloom which takes on a purple tint with ageing in the expanding part of the corolla. Free flowering, robust plants which soon form large clumps. Sufficiently hardy to grow out of doors in Holland. This form was used by Van Tubergen in developing some of his *Parkeri* seedlings.

(d) ETHYL HOUDYSHEL (New Name) Syn. *Brunsvigia rosea* var. *E. H.*, *Amaryllis belladonna* var. *Ethyl Houdyshel*.

A *variabilis* form turning dark rose in contrast to white throat. A "minor" seedling.

II. Inter-specific *Brunsvigia* hybrids

7. PARKERI HYBRIDS: Hybrids of *Brunsvigia gigantea* (Van Marum) Traub, syn. *Brunsvigia Josephinae* (Redoute)—pollen parent. Bulbs usually very large, 4-6" diameter, often with long pseudo-necks and wide foliage. Scapes long, umbels large, showy and richly colored, but seldom fragrant. *Eubrunsvigia* parentage can often be identified by a large yellow-orange eye or an orange throat in many of the hybrids. The open hemispherical pattern displayed by the umbel of most forms is quite distinct. A marked elongation of the pedicels is very evident as the fruit matures. Most forms are very sensitive to frost.

(a) KEWENSIS HYBRID (Common Name), Syn. *Brunsvigia Kewensis*, *Amaryllis belladonna* var. *Arbuckle*: Gard. Chron., 29. P. 37-38, 53; Pp. 71-72; 89-90; 111-112, 1901. HERBERTIA 1934, P. 57. R. H. S. Journal, Jan. 1926, P. 67. The Garden, 75, 1911, p. 462.

One of the better forms of Parker's original hybrids. Very attractive and fragrant. Grown in Kew Garden 1895-1901. Quite similar to the type named *Parkeri* in color and form, but lacking the large numbers of flowers to an umbel. Mrs. Arbuckle distributed the first hybrids in 1889, these having been developed in New Zealand about 1865.

(b) LADY PARKER (New Name), Syn. *Amaryllis Parkeri rosea*: The Garden, 1898, P. 57, Gard. Chron. III 50, 211., The Garden 75, 1911, P. 462 with fig. on P. 460. *Brunsdonna Parkeri*: Gard. Chron. 78, 1925, P. 391 & Fig. 164. R. H. S. Journal, 1926, P. 65-69.

A popular English form; flowers clear rose with a yellow-orange base, orange on outside of tube; pedicels suberect to horizontal with many blossoms on a tall red scape; umbel 16" across. Developed by Sir Henry and Lady Parker while in New South Wales.

(c) FRANK LEACH (New introduction by L. S. Hannibal)

Bulbs, 4" dia. x 6" long; plants vigorous and multiply rapidly; leaves, 10, 24" long x 2" wide and somewhat lingulate-lancelot; pseudo-stem, obscure, 2½" long; inflorescence, very free flowering on a red 30" scape in August; umbel open; flowers very pale self color on expansion, but becoming a deep satiny pink as they age, slightly fragrant; segments are quite narrow (¾") highly reflexed; fine white granular markings which glint in the sun produce a satiny-like texture; span, 5"; pedicels 2-3" long at flowering, but 6-8" long as fruit matures. See Fig. 89.

(d) OAKHURST HYBRIDS (Local name). Syn. *Amaryllis belladonna* hybrids.

Mixed hybrids of *Brunsvigia Parkeri* var. *Van Tubergeni* on "minor" and "rubra major" developed by Giridlian and Gordon Ainsley. The bulbs are very large with wide tapering leaves. Scapes red. Flowers of a deep rich color.

(e) WHITE QUEEN (New name), Syn. *Brunsdonna Parkeri Alba*. *Amaryllis Parkeri alba* Worsley: The Garden, 75, 1911, P. 460-462. R. H. S. Journal, 1926, P. 65-69.

Worsley called this his "Garden Brunsdonna." The flowers are pure white with throats of rich orange tone both inside and out. The umbel is very suggestive of a white flowered *Clivia*. This plant was derived from *Brunsvigia Parkeri* by Worsley in 1904. R. H. S. 1st. class award 11/9/28.

(f) VAN TUBERGEN (New name) Syn. *Amaryllis Parkeri* var. *Van Tubergeni*. Garden Chronicle, Jan. 23, 1909, with figure.

The name "*Brunsdonna*" was proposed by Van Tubergen in 1909 for this beautiful strain of hybrids that he developed by crossing *Brunsvigia Josephinae* with selected "Cape Belladonna" forms. Many of these hybrids are near white and the best were used as a basis for future breeding. The name "*Brunsdonna*" should be preserved for memory of this great Haarlem bulb firm.

(g) ZWANENBERG. Syn. *Amaryllis Parkeri* var. *Zwanenberg* Van Tubergen: HERBERTIA, 2, P. 113-114 inc. plate.

Plant free blooming with numerous large flowers on a long scape in October. These are colored deep rose and white, with a yellowish eye in the throat. A hybrid of "Van Tubergen's Brunsdonna" with *Purpurea major*.

(h) JAGERSFONTEIN (Van Tubergen). Syn. *Amaryllis* hyb. *Jagersfontein*.

A hybrid having deep rich pink flowers of a large size with yellow centers.

(i) JOHANNESBURG (Van Tubergen). Syn. *Amaryllis* hyb. *Johannesberg*.

Plant very free flowering with many light rose blossoms on a tall scape. This clone has the characteristic white throat and yellow base.

(j) KIMBERLY (Van Tubergen). Syn. *Amaryllis* hyb. *Kimberly*.

Blossoms of a deep rich pink, petals slightly striped turning deep crimson pink with age. Apparently a *rosea perfecta* hybrid.

(k) PRETORIA (Van Tubergen). Syn. *Amaryllis* hyb. *Pretoria*.

Having an umbel of 15 flowers of deep pink with large white throats and yellowish base.

(l) STELLENBOSCH (Van Tubergen). Syn. *Amaryllis* hyb. *Stellenbosch*.

Flowers with large white centers. Petals edged with pink lines. Throats yellow.

(m) ARLINGTON WORSLEY (New Name), Syn. *Brunsdonna pseudo blanda* Worsley. *Amaryllis pseudo blanda*: Gard. Chron. 84, 1928, P. 349.

A selfed seedling of *Brunsvigia Parkeri* which closely resembles *B. blanda* Herbert, having wide leaves and pale flowers which become entirely pink on the third day. Semi-hardy and late flowering on a 3½ foot scape.

(n) ELWES RUBRA (New Name), Syn. *Brunsvigia rosea* var. *rubra major*. *Amaryllis rubra major* Elwes: Gard. Chron. 84, 1928, P. 349. HERBERTIA 5, P. 57.

A *Brunsvigia* hybrid of unknown source. Bulb only semi-deciduous with pronounced pseudo-stem and wide leaves resembling *Brunsvigia blanda*. Free flowering with blossoms opening successively over a long period of time. Segments narrow, 1". Color of flowers a brilliant crimson-rose with yellow base. Plant very hardy. Elwes obtained this plant for *Brunsvigia blanda* about 1913.

(o) SANTA BARBARA (New Name). Syn. *Amaryllis rosea giridlian*, *Amaryllis Parkeri* var. *Orpet*. (see Catalogues)

A very late flowering form, described as rose and white with a yellow-orange throat. Apparently is very near to *Brunsvigia Kewensis*. Tender to frost.

(p) SANDERS WHITE (New Name), Syn. *Sanderi Alba*. *Brunsdonna Sanderi Alba*: The garden, 75, 1911, P. 462.

A reputed *Brunsvigia* hybrid that resembles a good white flowering *Parkeri*. Outside of the orange base in each flower there is little to indicate *Eubrunsvigia* parentage.

(q) SPAFFORTHIAE (New Name), *Amaryllis Spafforthiae* Herbert: Amaryllidaceae, P. 277, 1835.

A cross of *Brunsvigia blanda* with *Josephinae* effected by Herbert. No record of flowering plants can be found.

8. MULTIFLORA HYBRIDS. Hybrids developed by Bidwell supposedly of *Brunsvigia orientalis* (Syn. *B. multiflora*) on *Brunsvigia rosea*. Many beautiful forms with large flowers. Bulbs medium sized; leaves glaucous with blunt rounded tips. Flowers numerous on tall scapes, others on very short scapes. These hybrids are sensitive to frost.

(a) BIDWELL (New Name), Syn. *Brunsvigia Multiflora Bidwelli*: HERBERTIA, 2, P. 46. *Amaryllis multiflora*: Garden Chron. July 29, 1850, P. 470.

The original of several hybrid crosses effected by Bidwell in 1841. He was Supt. of the Botanical Garden at Sidney, N. S. W., and his crosses were made at the suggestion of Herbert, whose book had appeared 4 years earlier.

(b) WHITE MULTIFLORA (New Name), Syn. *Brunsvigia multiflora alba*: HERBERTIA, 2, P. 46. Syn. *Amaryllis Multiflora alba*.

Very vigorous and very free flowering. Blossoms are yellowish-white and not as large as many of the hybrids.

(c) ALABASTER, Syn. *Brunsvigia multiflora alabaster* (Cowlshaw), *Amaryllis alabaster* Cowlshaw: HERBERTIA, 2, P. 45 inc. plate.

A selfed pure white hybrid having many blossoms of excellent texture on a tall scape. Developed by Cowlshaw.

(d) HAYTHOR, Syn. *Brunsvigia Mult. hyb. Hathor*, *Amaryllis Hathor* Bradley: HERBERTIA, 2, 1935, P. 46.

A result of a pollen cross of "White Multiflora" on *Brunsvigia gigantea* (*Josephinae*). This is a pure white superior variety of large form very popular in Australia. It will not produce seed, but is an ideal pollen parent. Bulbs of this clone or a very similar clone were introduced into California many years ago by Mrs. Bullard and some seedlings were developed which are in cultivation. The true *Haythor* can be recognized by its ruffled petals with crimped edges.

(e) HARBORD (New name), Syn: *Brunsvigia multiflora Harbord*: HERBERTIA 2, 1935, P. 46.

Form developed by Halloway Bros. Of pure white blossoms.

(f) MONTAGUE (New Name), Syn: *Brunsvigia Multiflora intermedia*: (Montague Catalogue).

Flowers cream white, slightly shaded pink.

(g) ORVIETO (New name), Syn. *Brunsvigia Multiflora Orvieto*: HERBERTIA 2, 1935, P. 46.

Hybrid developed by Halloway Bros. A vigorous form of rich deep pink.

(h) AUSTRALIAN ROSE (New Name), Syn. *Brunsvigia multiflora rosea*: HERBERTIA 2, 1935, P. 46.

Large heads with 30-40 flowers. Excellent deep rose color with yellow cast in throat. Possibly a *Parkeri* type since Bidwell also used *B. Josephinae*.

(i) BAPTISTI (New Name), Syn. *Brunsvigia hyb. Baptist*, *Amaryllis Baptisi*; (Montague Cat.), *A. baptiste alba*: A. Worsley, Gard. Chron. 1932, P. 413.

Described as having yellow-white blossoms in Montague's catalogue. Apparently an alba form is available. The long neck suggests *B. multiflora* parentage.

(j) ORPET WHITE (New Name), Syn: *Amaryllis Orpet White*.

A hybrid form having parentage of *Brunsvigia multiflora Haythor*. Nearly pure white.

* * * * *

9. BRUNSCORE FORMS. Hybrids of *B. rosea* on other *Brunsvigia* spp. These *Brunscore* are seemingly difficult to raise. Growth is very slow and they seldom produce offsets. Not free flowering, but having very attractive bloom not

unlike a *Brunsvigia* on large spreading many-flowered umbels. None are in the trade.

(a) QUEEN WILHELMINA (New Name), Syn; *Brunscore Tubergeni*, *Brunsdonna Tubergeni*: Gardener's Chron. —, HERBERTIA, 5, P. 58.

B. gigantea (Syn. *Josephinae*) X *B. rosea* hybrid of unusual form. These plants take 15 or more years to mature and resemble a *Brunsvigia*, but give a wide variety of color and form of which the above represents one of the finest. Van Tubergen is apparently the only person who has succeeded in raising the cross to maturity. The writings of Bidwell suggest that he did not obtain any *Brunscore*, at least mature plants.

* * * * *

III. Inter-generic hybrids of *Brunsvigia* and *Crinum*.

1. BRUNSCRINUM HYBRIDS having *Crinum Moorei* or other *Codonocrinum* as a pollen parent. The only forms known at present are *Crinum*-like in growth, having white or rose blossoms which are often very fragrant. Bulbs are very large and quite hardy. Foliage evergreen, resembling *Crinum Powellii* in type and habits. Plants sterile; Forms in gardens apparently represent F-1 generations.

(a) *Brunscrinum Burbankii* (syn: *Crinum-Amaryllis* Burbank: Monograph, Vol. 9, 1914, P. 72 with figure. HERBERTIA 1942, Pp. 150-156.)

A bigeneric hybrid developed by Luther Burbank, Details of the *Crinum spp.* used is vague and no knowledge of existing specimens can be found. The hybrid had 8-10 blossoms of a clear white *C. Moorei* type.

(b) *Brunscrinum Corsii*, Syn. *Crindonna memoria Corsii* Ragionieri: Gard. Chron: Jan. 15, 1921, HERBERTIA 1, P. 64, 1934. Curtis Bot. Mag.: Tab. 9162.

A hybrid similar to Mr. Howards but of fewer flowers to an umbel, and colored very light pink. Dr. Ragionieri named this plant in memory of the Marquis Bardio Corsi Salvati of Florence.

(c) *Brunscrinum Howardii*, Syn. *Amarcrinum Howardii*: Gard. Chron. Nov. 21, 1925, Vol. 78, P. 411, fig. 171. HERBERTIA 9, P. 200, 1942.

A bigeneric hybrid of *Brunsvigia rosea* X *Crinum Moorei*. An extremely hardy plant of very vigorous growth. Semi-evergreen, flowering periodically through the summer with tall scapes bearing numerous clear soft pink blossoms. Extremely fragrant with odor resembling apple blossoms. Bulbs large, up to 8" in diameter; enjoys warm moist situations, but desires some shade in citrus areas. R. H. S. Cory cup award in 1926.

* * * * *

Note: *Brunscrinum* hybrids are easily produced. It is reported that Dean Herbert made a similar cross about 1835, but like his *Brunsvigia* X "Belladonna" crosses no record is available. Unflowered hybrids produced by the writer using "minor" as a seed parent have a habit of blasting—One bulb split into 18 bulblets last spring. Since it is impossible to flower plants with such habits about 80% of the seedlings were discarded. It is of additional interest to note that of 4 variations of *Crinum Moorei* used for pollen parent only two took, one with extreme difficulty. Several *Powellii* hybrids including *C. Cecil Houdyshe* also failed.

Otto Staph (Curt. Bot. Mag., Tab. 9162) is of the opinion that *Crinum revoluta* (Syn: *C. lineare*) and *C. variabilis* are allied to this group as their blossoms differ little from the *Brunscrinum*.

LITERATURE CONSULTED

Specific references are given in the text; the following may also be of interest:

The Garden (London); 33, P. 258; 47, P. 46; 49, P. 276; 54, P. 414.

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Lamarck's Dict. Enc. de Bot. 1, 1789, P. 122, and supplement of 1810-1817.

A. Worsley: *Amaryllis Parkeri*, R. H. S. Journal 11/09.

A. Worsley: *Brunsdonna Parkeri* with Fig. Gard. Chron. Illustrated, 3/10/25. Gard. Chron., 14/11/25.

A. Worsley: The *Brunsdonnas*, R. H. S. Jour., 1926, P. 65.

A. Worsley: *Amaryllis* (*Brunsvigia*) *Slateriana*, with Fig., Gard. Chron. 12/1/29.

A. Worsley: *Amaryllis Baptiste alba*, Gard. Chron. 1933.

A. Worsley: *Amaryllis* (*Brunsvigia* & *Crinum* in parte) R. H. S. Jour. 1932. 57, pp. 8-14.

Redoute: *Les Liliacees*, Vol. 3, t 150, 1806.

Catalogues referred to:

Howard & Smith, Montebello, Calif.

Orpet, Santa Barbara, Calif.

Cecil Houdyshel, (1942), La Verne, Calif.

J. N. Giridlian, (1942), Arcadia, Calif.

Barr's general Bulb Catalogue, (1935), London.

Van Tubergen Ltd., (1940), Haarlem, Netherlands.

Phillip Montague, (1933), Frankston, Australia.

D. J. W. Chandler, Tacoma, Victoria, Australia.

CRINUM MOOREI VAR. FRANK LEACH

L. S. HANNIBAL, *California*

Several years ago Mr. Frank Leach called our attention to a particularly fine specimen of *Crinum Moorei* which was growing in his garden at Diablo, Calif. The blossoms were a very light blush pink and far larger than normally seen on the common *Moorei* type. During Dr. Traub's visit here we examined the plant and he reported that it was one of the finest he had seen, adding that it was unusual for *Moorei* blossoms to remain open all day in part sun without wilting, especially where the relative humidity drops to 30-50 percent. In tracing the clone we found that it came from an original planting of 1866 by Olmstead and Olmstead, the nationally known landscape firm of the last Century, who had used the bulbs in landscaping the Mountain View Cemetery of Oakland, California. Just where the stock came from previous to that, or if any of the ramets of the clone are in circulation, we do not know. The plant has several very interesting features. It is quite hardy, as it normally can stand two or three degrees more frost than the common *Moorei* before the leaves burn. Winter frosts of 17 degrees which cut it back have not impaired its flowering quality. Here it flowers in August—in Florida it flowers in April (Specimen #A-299). Seedling plants lack the quality of the parent which suggests that the clone may be a hybrid, but it is more likely that it came from selected stock. However, attempts to use it in crossing with the Cape Belladonna Lily (*Brunsvigia rosea*) were a complete failure. Normally this cross is extremely easy to make. This last behavior suggests the existence of some chromosome irregularity which makes the plant distinct from the typical *C. Moorei*. Since no record of a similar clone has been noted in the literature the name of *Frank Leach* is proposed—to keep in memory the name of a grand old man who knows and loves his flowers.

HAEMANTHUS COCCINEUS VAR. ALBUS, STANFORD, VAR. NOV.

All of us who are plant collectors can look back on certain red-letter days when the real treasures first appeared.

Such a day I remember when a neighbour rang me up to say that she had found a white *Haemanthus*. I was not very thrilled, a white form of a flower so often means just loss of colour—but all the same I went to see it.

The intense beauty of the flower gave untold pleasure. It was a white form of *Haemanthus coccineus* which grows plentifully on the hill sides and on the sandy flats, but no one had ever seen a white one before. The flower is most striking as the segments of the spathe are ivory white with the thick crisp texture of a Begonia, and the whiteness is intensified in contrast with the mass of golden yellow anthers. (See Fig. 91.)



Fig. 91. *Haemanthus coccineus* var. *albus*, Stanford, var. nov. Photo by A. C. Buller, Union of South Africa.

The stout stems are about a foot long and the flower pushes through the hard dry ground in early autumn and dies away with the first rains when the leaves appear. These grow to 2 ft. in length and some are 1 ft. across; they remain all winter but when the days get warm they dry off and there is nothing to be seen of the plant until autumn comes again.

Fortunately these treasures fell into good hands, the bulbs were marked and removed from the hill side when dormant and they are now flourishing in the safety of the finder's garden where they have set seeds and one bulb is making offsets.

The botanists tell us that they have no record of a white form of *Haemanthus coccineus* but we think it is possible that the plant may vary since a visiting British sailor and a small girl taking a stroll on

the hill side returned with a flower of a beautiful coral pink, neither of them knowing that it was anything unusual. However the bulb was located and is now safely in cultivation and the hybridist's fingers are itching. There is a white flowered *Haemanthus* in the Eastern Province of the Cape but that is quite different, the flowers are much smaller and the leaves are developed while the plant is in bloom.

The one of which I write is quite unique and probably more will be heard of it later but please do not write and order bulbs, it is not to be seen in the writer's nursery.

K. C. STANFORD

*Bloem Erf Nurseries,
Stellenbosch, South Africa*

DAYLILY DISPLAY GARDEN AT THE UNIVERSITY OF FLORIDA

JOHN V. WATKINS,

Assistant Professor of Horticulture, University of Florida

During the summer of 1943, it was necessary to change the site of the Daylily Display Garden on the campus of the University of Florida. Guided by Daylily polls, published evaluations, and the remarks of garden visitors, some 64 commercial varieties were selected for the new garden. As one of the functions of a regional test garden is to grow, and to evaluate seedlings, a part of the 1943 planting is devoted therefore to newly named selections that have been received for trial from *Hemerocallis* hybridizers. Because of the labor shortage it was necessary to abbreviate our list considerably, and to plant the daylilies in single clumps rather than in triangles of three as was our arrangement in the past.

As Dr. MacDaniels, Mr. Shull, and other writers in HERBERTIA have suggested, a list of daylilies must necessarily be a fluid thing. Therefore, our present catalogue is quite different from that of a few years ago, and it is certain that future lists will be very different from the one detailed in Table I.

TABLE I

DAYLILY COLLECTION, UNIVERSITY OF FLORIDA, 1943

Araby	George Yeld	Queen Wilhelmina
Aureole	Golden Glow	Radiant
Aurillo	Granada	Reba Cooper
Bijou	Hankow	Rouge Vermilion
Brownie	H. aurantiaca	Russell Wolfe
Carnival	Helen Wheeler	San Juan
Chisca	Indian Chief	Semperflorens
Cleo	John Blaser	Senator Andrews
Corinne Robinson	Kanapaha	Serenade
Cypriana	La Tulipe	Sir Michael Foster
Dauntless	Lidice	Sonny
Doctor Hughes	Linda	Sybil
Doctor Stout	Marcelle	Theodore Mead
Duchess of Windsor	Margaret Perry	Vesta
Elaine	Mayor Starzynski	Victory Taierhehwang
Emberglow	Mikado	Victory Montevideo
Emily Hume	Mildred Orpet	Vulcan
Estelle Friend	Mrs. John J. Tigert	Wekiwa
Fire Red	Osceola 2	Welaka
Fred Howard	Parthenope	Winsome
General MacArthur	Patricia	
George Kelso	Peony Red	

REGIONAL TEST GARDENS

Consistent with the policy of full collaboration with the five other Regional Test Gardens, the University of Florida sent out certain clones of *Hemerocallis* on June 15, 1943. These clones were, in all cases, varieties that had not been included in the shipments made to these gardens in the summer of 1942, and they have effectively increased the varietal lists of these gardens. In those cases where a sufficient stock permitted, three divisions of each variety were sent; if the variety was a slow growing type, in some cases it was possible to send only one division.

THE TEXAS COOPERATIVE DAYLILY TRIAL GARDEN

WALTER S. FLORY, *Horticulturist*
Texas Agricultural Experiment Station

A brief history and summary of the work carried on at the Texas Agricultural Experiment Station's Cooperative Daylily Trial Garden to date is given in the following paragraphs.

The test plots of the Texas Agricultural Experiment Station have contained a few varieties of daylilies since 1938. These have been included with a test garden of various plants belonging to the botanical groups with which the American Amaryllis Society is concerned. The original daylily varieties were received from the American Amaryllis Society in late 1937. This number was supplemented in June 1938 by a few varieties, and also some breeding selections, from Mr. H. M. Russell of Houston, Texas. In addition a few varieties were purchased later and added to this collection. This garden only contained about two dozen daylily varieties by the spring of 1942.

During the summer of 1942 the American Amaryllis Society designated College Station, Texas as the location of one of the cooperative daylily testing gardens, with the Division of Horticulture of the Texas Agricultural Experiment Station having charge of this. Since then Professor John V. Watkins has sent two generous shipments of daylily varieties from the University of Florida Daylily Trial Garden. About sixty varieties were added to the Texas garden by these shipments.

All varieties that appear to have flowered normally have been rated by the score card published on page 126 of the 1940 HERBERTIA. The few which have been scored for at least two years at College Station are listed here in the approximate order of their initial time of blooming. Excellent (9.0 and above): Mikado (late April), Russell's U-3, fulva Europa, Ophir, Queen of May, Margaret Perry (June 1), August Pioneer (July 1), Good (8.0 to 8.9): Cinnabar, George Yeld, The Miller's Daughter, Golconda. Fair (7.6 to 7.9): fulva maculata. Poor (7.5 and below): Missiana Russell, Spartan.

About 15 other varieties have been scored in one year only. Of these Mrs. John T. Tigert has shown up especially well. Some 30 additional varieties have not yet flowered, and a few varieties have been lost. Of the varieties which have not yet flowered Eldorado, Florham, fulva cypriana and Gold Imperial are making especially vigorous and attractive vegetative growth.

It is easy to see from the above that our test garden is really just getting underway. We hope to increase the number, especially of late-flowering, varieties materially. The stamina of the daylily enables it to survive the rigorous Texas summers when less hardy plants are eliminated. This makes the selection of the best varieties, covering the longest possible flowering season, especially desirable for this section of the country.

WHITNALL PARK DAYLILY TRIAL GARDEN

CHARLES E. HAMMERSLEY, *Wisconsin*

In the last ten years daylilies have become famous throughout the country. Year by year, these fine flowers are filling a large place in the hearts and gardens of flower lovers everywhere, and the constant demand for new and better varieties exceeds the supply.

Early in August, 1941, the writer was advised by our Secretary Mr. Hayward, that Dr. Hamilton P. Traub was doing special work at the University of Wisconsin, and suggested that the writer contact him. The writer wrote Dr. Traub, inviting him to visit the Milwaukee County Park System, and particularly, the Arboretum at Whitnall Park, which he did on August 23, 1941. The writer arranged to have Alfred L. Boerner, Superintendent of the Milwaukee County Parks, to accompany them. Several of the parks were visited, and while at Whitnall Park, Dr. Traub suggested that a Daylily Experimental Garden ought to be established there. Mr. Boerner had advised the writer several years before, that he was desirous of obtaining a large collection of daylilies for Whitnall Park, and perhaps we steered Dr. Traub into the suggestion. (I hope that he will forgive us,) because I believe that the results will eventually justify his faith in the location. So that this was the beginning of the Daylily Trial Garden at Whitnall Park.

Whitnall Park Arboretum is the only publicly supported institution of its kind, and consists of more than 1200 acres, protected from the North and West with a stream running through it. They already have large plantings of various groups of trees, shrubs and perennials. Before gas rationing, an average of more than 10,000 people visited this Park on Sundays—and it is only one of the seventy parks in this county. The Milwaukee County Parks have an annual \$1,000,000. Already one public-spirited citizen has donated a group of tree peonies, and it is expected that other public-minded citizens will likewise contribute various rare groups.

The Experimental Garden has been located just West of the main garden promenade, which has a Southerly and Westerly exposure, providing good drainage and ample sun for the development of the plants. The Park authorities now have a record of every tree and plant on the grounds, and have agreed to keep a complete record of every daylily and daylily cross made.

Dr. Traub promised to send to the Park some of his new introductions, and Mr. Seyler of the Farr Nursery has contributed all of Dr.

Stout's originations, and has promised such new ones as may come along. Our Secretary, Mr. Hayward, has likewise agreed to make a contribution of some of his introductions. At this point, I cannot too highly praise

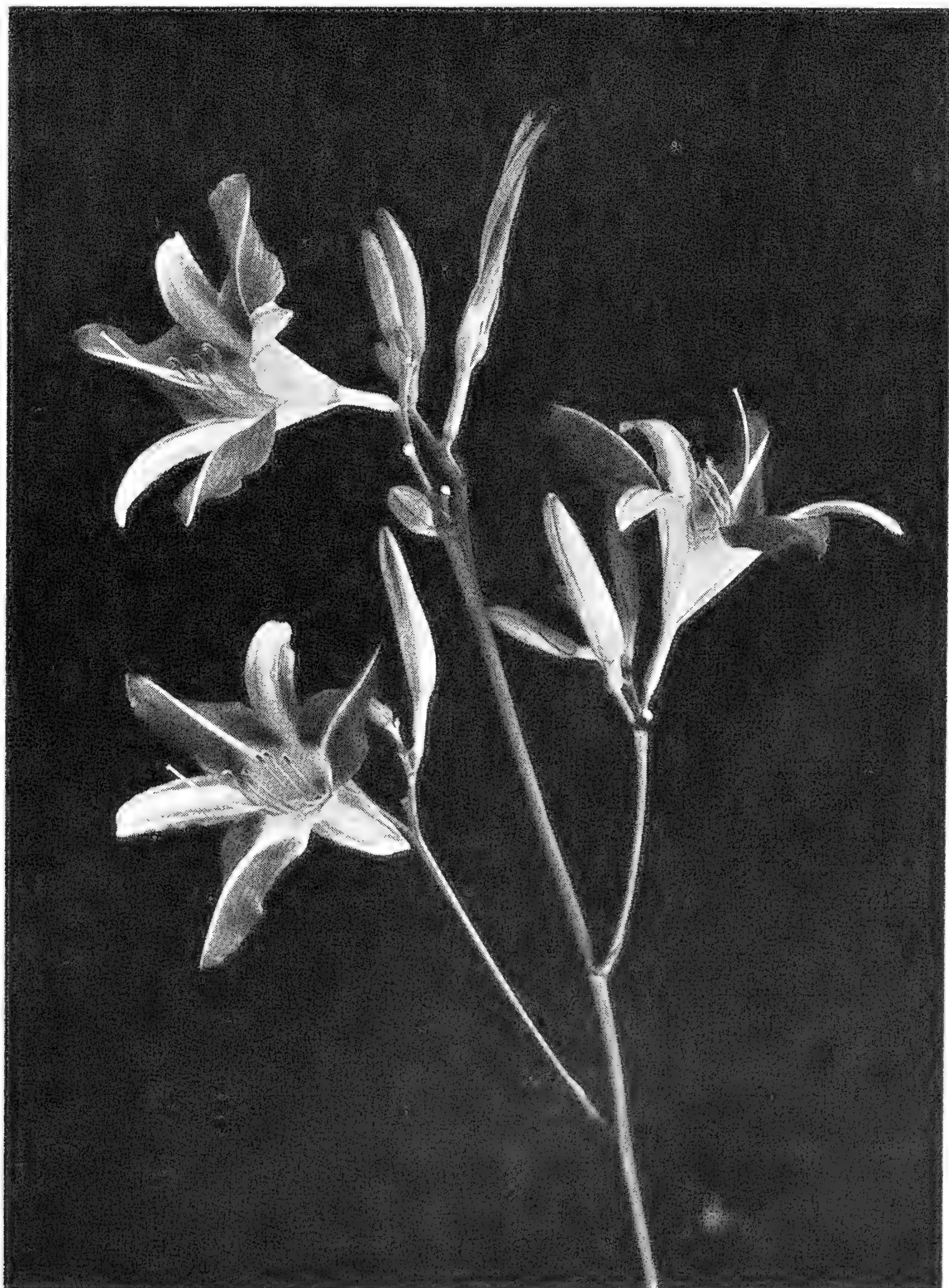


Fig. 92. Flowers and scape of the Festival Daylily. About 1/3 natural size. From the same plate that appeared with the first description of the clone.

the contributions made by Prof. John W. Watkins of the University of Florida, who has generously sent three plants of a large number of varieties, and has promised to continue to do so as new varieties become

available. No man in this country has done more to expand the daylily interests than Prof. Watkins, and I want to publicly commend him for his interest and generosity. We have planned at Whitnall Park to segregate the introductions of various originators and their donors, and to put up a permanent placard showing who donated the plants, and we invite all originators of daylilies to send their introductions to Whitnall Park where the world will be advised of their introductions, and introducers given credit for their work.

Much of the credit for the development of the daylily goes to Dr. A. B. Stout, who was born only a few miles from Whitnall Park, and who graduated from the University of Wisconsin, and who has spent his life in the development of this flower. We want to acknowledge our debt to him for asking Mr. Seyler of the Farr Nursery to contribute the Stout introductions.

Our daylily collection has now more than 100 varieties, including many fine new varieties of the great originators. We want the world to know that Milwaukee at Whitnall Park has joined the modern march to appraise the *Hemerocallis*. The wide-spread interest in the new varieties has already brought countless visitors to the Park. They stand in awe and admiration when they see pinks, reds and soft yellows and lovely oranges. They say they never dreamed it possible that there could be so many beautiful varieties and they say they are well paid for their trips.

On the 5th of May, 1942, Elmer Claar of Wilmette, Illinois addressed several hundred people of this Community on the daylily, and showed his excellent pictures which had been taken in many hybridizers' gardens in this country. Mr. Claar is an enthusiastic plantsman, and has done much, and is still doing more, to advance the development and interest in daylilies. No garden talk in years has caused so much comment and favorable action as his.

I hope that those who read this report will start a collection of daylilies. No plant offers as great an opportunity to the amateur to hybridize and develop new varieties as the day-lily. The daylily grows almost anywhere, in any kind of soil, stands almost any kind of treatment, is subject to no diseases, and always blooms profusely.

We hope that when you are in our locality, that you will visit our seventy Milwaukee County parks, and particularly the Arboretum and Daylily Trial Garden at Whitnall Park.

THE ELMER A. CLAR DAYLILY

A. B. STOUT, *The New York Botanical Garden*

The seedling with its propagations that is here named the *Elmer A. Claar Daylily* is a sister of the plant that was named the *Festival Daylily*.^{*} Due to an inadvertent mixture during nursery propagations divisions of these two seedlings were in several instances distributed under the one name of *Festival*. After the first selections in this particular

^{*} Journal of The New York Botanical Garden 40:32-34, 1939.

series of plants were made in 1929 five seedlings were kept under evaluation until 1934. Then only two were kept and these were propagated and further evaluated in the trial plots of The Farr Nursery Company for the next five years. Thus after ten years of comparisons and evaluations one of the two clones was described under the name *Festival Daylily* and it was intended that the entire stock of the other seedling would be destroyed.



Fig. 93. Flowers and scapes of the Elmer A. Claar Daylily. About $1/3$ natural size. Photo New York Botanical Garden.

But evidently there was some mixture of these two clones for divisions of both were obtained by several persons including Mr. Elmer A. Claar whose published statements ** are, in part, as follows:—

** *Herbertia* 9:31. 1942.

“*Festival*—There are apparently two plants, somewhat different, by this name. The true *Festival* does not appear to me as being as interesting as the one with which it is mixed. It is not nearly as contrasty in coloring. This is a flower you should not miss. The petals are orange with reddish brown tinges, sepals are nearly English red with darker veins and an orange midstripe. The effect is a bicolor.”

It is quite probable that this clone which is *not* the *Festival Daylily* will remain in cultivation and become somewhat distributed. Hence it should have an individual name under which it may be kept distinct from any other clone.

The illustration for the flowers of *Festival* here reproduced (See Fig. 92) is the same halftone plate that was used with the original description; that (Fig. 93) for the flowers of the *Elmer A. Claar Daylily* is from a photo taken in 1934 and the following descriptions are from notes recorded during the ten years that the plant was under selection. Plants of this clone have reached a stature of from three to four feet. The flowers are medium full and of medium size. In the throat the color is near cadmium yellow with a stripe extending out along the midrib of *each petal* (not of each sepal); the anthocyanin coloring in the petals is near garnet brown with more intense color in the veins. The sepals have the general ground color of cadmium-yellow plastid pigmentation with areas of red sap pigments that are much less intense than in the petals, a distribution well shown in Fig. 93. In comparison with *Festival* the flowers are of a distinctly different shape, the petals being shorter and not twisted. Also the ground color is less orange and more yellow and the pattern of the red sap pigment is much less fully bicolor.

In my record of the final evaluations in 1937 there are the following notes for this plant. *Paler, less orange, and less bicolor than its sister under selection. We have better bicolours now. Can discard.* A comparison of Figs. 92 and 93 shows that the scapes of the *Elmer A. Claar Daylily* are less branched and floriferous than are those of *Festival*. But the naming of this daylily, largely due to Mr. Claar's remarks, will now give chance for evaluation by the gardening public. This mention of better bicolours refers to the race of which *Bicolor* and *Harlequin* were later named and which was first mentioned and illustrated in the issue of the magazine *House and Garden* for June 1936. The *Festival Daylily* is a bicolor with orange background; *Bicolor* and *Harlequin* have an almost yellow background.

From 1929 to 1934 the two seedlings, now named *Festival* and *Elmer A. Claar*, were rated highly among the seedlings which had bi-colored and semi-bicolored patterns and both were used in selective breeding. The plant now named *Elmer A. Claar* was a parent in 21 different series of seedlings which totaled over 200 individuals, but not one of these was rated worthy of introduction, and nearly all have been discarded.

HORTICULTURAL CLASSIFICATION OF NARCISSI

COMMUNICATION FROM A. SIMMONDS,
Royal Horticultural Society, London, England

[The following communication was received from Mr. A. Simmonds, Secretary, Narcissus and Tulip Committee of the Royal Horticultural Society, London, under date of August 10, 1943. The American Amaryllis Society is in hearty accord with any attempts to bring the horticultural classification of Narcissi up-to-date. All members interested in this group are urged to send any suggestions they may have, without delay to the Narcissus Committee in care of Mr. L. S. Hannibal, Executive Secretary, Concord, Calif. The Committee will assemble these suggestions and transmit a summary to Mr. Simmonds.—*Editor*]

THE CLASSIFICATION OF DAFFODILS

As you are aware, in 1909 this Society drew up a system for the classification of Daffodils for show purposes which, with the minor adjustments which have been made from time to time, has found acceptance not only in this country but among Daffodil specialists generally. In the course of time, and with the gradual development of new types, ideas for the improvement of the scheme have occurred to many people and my Committee, therefore, appointed a Classification Sub-Committee to review the scheme in the light of suggestions which had been received from various sources. It is not proposed to make any alterations until it has been possible to consult all the more important groups of Daffodil specialists overseas, and that will not be until Holland is again free. It seems desirable, however, that some progress should be made so that, as soon as we are again in touch with our Dutch friends, we may be able to invite their comments on concrete proposals which appear to meet with the approval of the majority of other interested parties.

My Sub-Committee has held one meeting and has selected from a wealth of suggestions those which appear to it to be both desirable and practicable. I enclose a copy of the existing scheme, together with a copy of a tentative scheme embodying the above-mentioned suggestions. It will be observed that the suggested modifications are as follows:—

- (1) To abolish the Leedsii Division and to transfer the varieties concerned to the Incomparabilis and Barrii Divisions.
- (2) To provide in the Incomparabilis and Barrii Divisions a third Sub-Division, lettered (c) for varieties which are wholly white or whitish and formerly classified as Leedsii varieties; and to re-arrange the Trumpet Division so that the Sub-Division for varieties which are wholly white or whitish is lettered (c) instead of (b) as at present.
- (3) To specify that in the Trumpet, Incomparabilis and Barrii Divisions the corona may not be paler than the perianth segments, as a place is provided elsewhere [See (9)] for varieties with “reversed” colours.

- (4) To amend the specifications for Sub-Divisions (a) and (b) of the Trumpet, Incomparabilis and Barrii Divisions so as to allow of the corona being any colour other than white, thus providing for the existing pink-cupped varieties and the red-trumpeted varieties of the future.
- (5) To transpose the Poeticus Division so that it becomes Division IV and fills the gap left by the abolition of the Leedsii Division.
- (6) To transfer to Division XI such species and wild or reputedly wild forms of species as are at present included in other Divisions, e.g. the wild forms of *Narcissus poeticus*.
- (7) To subdivide the Cyclamineus Hybrids in the same way as Triandrus Hybrids.
- (8) To change the number of the Division for Double Varieties from X to XX.
- (9) To create a new Division, numbered X, for "Miniature and Miscellaneous Garden hybrids," to accommodate, among others, garden hybrids with "reversed" colours, i.e. with the corona paler than the perianth segments, and varieties in which the corona is divided.

As will be gathered, my Sub-Committee has given consideration to many suggestions which appear to it to be either impracticable or to have less to recommend them than the disadvantages which they would involve. In this connexion it has been constantly borne in mind that the ideal Classification is one which is readily followed by any novice who is prepared to give the matter a little attention, and is such as to permit a non-specialist to classify almost any unknown variety without the aid of a colour chart or of special appliances for making measurements.

As is well known, with the great increase in varieties which has occurred during recent years, many border-line varieties have naturally been produced. This has been particularly marked in connexion with the border-line between Trumpet varieties on the one hand and Incomparabilis and Leedsii varieties on the other. As a result various suggestions have been made for the alteration of the specification of Trumpet varieties so as to permit of the inclusion in Division I of varieties in which the corona is $\frac{7}{8}$, $\frac{9}{10}$ or some other similar fraction of the length of the perianth segments. My Sub-Committee is of opinion that such proposals are impracticable because of the difficulties they would involve in measuring and in the resulting re-classification of numerous varieties, and would, at the same time, increase the difficulty of deciding on which side of the borderline many varieties should be placed.

It has also been suggested that where classification is by measurement a "tolerance" should be specified, but my Committee considers that anything which leaves the classification of a variety as a matter of opinion, as distinct from fact, is undesirable because it is certain to lead to varieties which are, for practical purposes, identical, being placed in different Divisions or Sub-Divisions.

Several breeders have given much attention to the production of varieties with pink colouring, and no doubt such varieties will soon be numerous. It has consequently been suggested that special Sub-Divisions should be provided for varieties with pink colouring in the cup. My Committee does not favour the proposal because it considers that the determination of the point at which pink ends and other colours begin is such that it can be decided only with the aid of a colour chart. It will be observed, however, that the specifications for Sub-Divisions (a) and (b) of Divisions I, II and III in the Tentative Scheme provide for coronas with pink as well as other colours.

My Sub-Committee would be grateful if you would be so kind as to bring the matter before your Society and let me know its views at your earliest convenience.

Yours faithfully,

A. Simmonds, Secretary,
Narcissus and Tulip Committee.

THE ROYAL HORTICULTURAL SOCIETY'S
CLASSIFICATION OF DAFFODILS

I EXISTING SCHEME—1943

DIVISION I—TRUMPET DAFFODILS

Distinguishing character—Trumpet or crown as long as or longer than the perianth segments.

- (a) Varieties with yellow or lemon-coloured trumpets, and perianth of same shade or lighter (but not white).
- (b) Varieties with white trumpet and perianth.
- (c) Bicolor varieties, i.e., those having a white or whitish perianth and a trumpet coloured yellow, lemon, or primrose, etc.

DIVISION II—INCOMPARABILIS

Distinguishing character—Cup or crown not less than one-third but less than equal to the length of the perianth segments.

- (a) Yellow shades with or without red colouring on the cup.
- (b) Bicolor varieties with white or whitish perianth, and self-yellow red-stained, or red cup.

DIVISION III—BARRII (INCORPORATING BURBIDGEI)

Distinguishing character—Cup or crown less than one-third the length of the perianth segments.

- (a) Yellow shades, with or without red colouring on the cup.
- (b) Bicolor varieties with white or whitish perianth and self-yellow red-stained, or red cup.

DIVISION IV—LEEDSII

Distinguishing character—Perianth white, and cup or crown white, cream or pale citron, sometimes tinged with pink or apricot.

- (a) Cup or crown not less than one-third but less than equal to the length of the perianth segments.
- (b) Cup or crown less than one-third the length of the perianth segments.

DIVISION V—*TRIANDRUS* HYBRIDS

All varieties obviously derived from *N. triandrus*, such as *Queen of Spain*, *Earl Grey*, *Eleanor Berkeley*, *Moonstone* and *Agnes Harvey*.

- (a) Cup or crown not less than two-thirds the length of the perianth segments.
- (b) Cup or crown less than two-thirds the length of the perianth segments.

DIVISION VI—*CYCLAMINEUS* HYBRIDS

DIVISION VII—*JONQUIL* HYBRIDS

All varieties obviously derived from Jonquils (e.g., *N. Jonquilla*, *N. juncifolius*, etc.), such as *Buttercup*, *odorus*, etc.

DIVISION VIII—*TAZETTA* (GARDEN FORMS AND HYBRIDS)

To include *N. Tridymus*, *poetae* varieties, the Dutch varieties of *Polyanthus Narcissus*, *N. biflorus* and *N. Muzart*.

DIVISION IX—*POETICUS* VARIETIES

DIVISION X—*DOUBLE* VARIETIES

DIVISION XI—*VARIOUS*

To include *N. Bulbocodium*, *N. cyclamineus*, *N. triandrus*, *N. juncifolius*, *N. gracillis*, *N. Jonquilla*, *N. Tazetta* (wild forms), *N. viridiflorus*, etc.

II. TENTATIVE SCHEME

DIVISION I—*TRUMPET* VARIETIES

Distinguishing character—Trumpet or corona as long as or longer than the perianth segments, and not paler in colour.

- (a) Perianth and corona both coloured, i.e., yellow or any colour other than white.
- (b) Perianth white or whitish and corona coloured, i.e., yellow or any colour other than white.
- (c) Perianth and corona both white or whitish.

DIVISION II—*INCOMPARABILIS* VARIETIES

Distinguishing character—Cup or corona not less than one-third, but less than equal to, the length of the perianth segments, and not paler in colour.

- (a) Perianth and corona both coloured, i.e., yellow or any colour other than white.
- (b) Perianth white or whitish and corona coloured, i.e., yellow or any colour other than white.
- (c) Perianth and corona both white or whitish.

DIVISION III—*BARRII* VARIETIES

Distinguishing character—Cup or corona less than one-third the length of the perianth segments, and not paler in colour.

- (a) Perianth and corona both coloured, i.e., yellow or any colour other than white.

- (b) Perianth white or whitish and corona coloured, i.e., yellow or any colour other than white.
- (c) Perianth and corona both white or whitish.

DIVISION IV—*POETICUS*—GARDEN FORMS

Garden forms of any of the *poeticus*.

DIVISION V—*TRIANDRUS*—GARDEN FORMS AND HYBRIDS

Garden forms of *triandrus* and hybrids in which *triandrus* characteristics clearly predominate.

- (a) Cup or crown not less than two-thirds the length of the perianth segments.
- (b) Cup or crown less than two-thirds the length of the perianth segments.

DIVISION VI—*CYCLAMINEUS*—GARDEN FORMS AND HYBRIDS

Garden forms of *cyclamineus* and hybrids in which *cyclamineus* characteristics clearly predominate.

- (a) Cup or crown not less than two-thirds the length of the perianth segments.
- (b) Cup or crown less than two-thirds the length of the perianth segments.

DIVISION VII—*JONQUILLA*—GARDEN FORMS AND HYBRIDS

Garden forms of any of the *Jonquilla* group and hybrids in which characteristics of the *Jonquilla* group clearly predominate.

DIVISION VIII—*TAZETTA*—GARDEN FORMS AND HYBRIDS

Garden forms of any of the *Tazetta* group and hybrids in which the characteristics of the *Tazetta* group clearly predominate.

DIVISION IX—*DOUBLE VARIETIES*

DIVISION X—*MINIATURE AND MISCELLANEOUS GARDEN HYBRIDS*

DIVISION XI—*SPECIES AND WILD FORMS*

All species and wild or reputedly wild forms.

WORSLEYA, GENUS NOV., AMARYLLIDACEAE

HAMILTON P. TRAUB

Amaryllis procera was first described by Duchartre in 1863 but it did not come into cultivation until quite recently. The late Arthington Worsley (1929, 1936) made a study of this species in its native habitat,

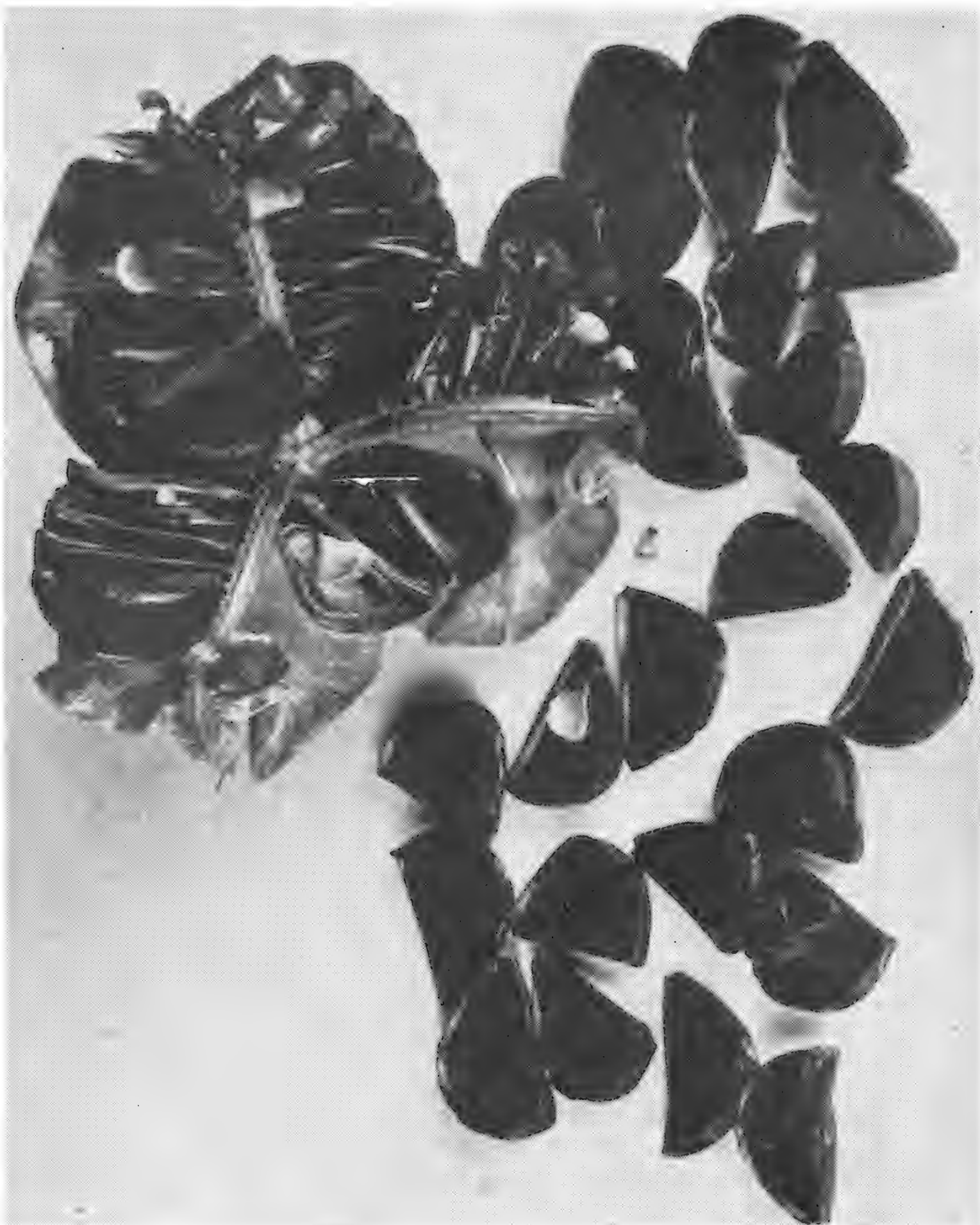


Fig. 94. *Worsleya procera* (Duchartre) Traub, gen. nov. Capsule and seeds, natural size. Grown at Las Positas Nursery, Santa Barbara, Calif. Photo by W. M. James.

and later grew it at his home in England. When the late William Watson, the Kew botanist, saw them in their glory, he was struck by their distinct appearance, and proposed that the species be used as the

basis of a new genus to be named in honor of Mr. Worsley. The latter was a very modest man, and suggested that the project be postponed until the species could be studied more in detail. Since that time, the interest in the species has increased. Much has been written about it in the past decade (See literature citations below). The Blue *Amaryllis* has been flowered in Florida (Anderson, 1940; Traub 1940); at the Las Positas Nursery, Santa Barbara, California (Lytel, 1942), and in England (Pam, 1943).

At the request of Mr. Lytel at Las Positas Nursery, Mr. James made some excellent photographs of the group of plants that are thriving there. He has also made some close-ups of the fruits and seeds. These photographs are reproduced in Plates 245, 246, and Fig. 94. The more important differences between the present species and the others classed under the Genus *Amaryllis* are summarized in Table I.

Mr. Worsley (1929) was the first to describe the fruit and seed characters of this species. Later, Traub (1940) reported on the seed structure in still greater detail. The seeds are D-shaped, jet black, the inner edge is thinner than the outer which is somewhat sunken and wrinkled between the margins of the side walls. On the basis of seed anatomy, this species is set off distinctly from the other species included under the genus *Amaryllis*.

The gestation period in the case of the present species is more than two and a half times as long as in the other species classed under the same genus.

There are four spathe-valves in the present species (Traub, 1940; Pam, 1943). The two outer valves are somewhat larger than the inner two. In the other *Amaryllis* species there are only two spathe-valves.

The leaves in the present species are falcate as contrasted with linear, lorate or petiolate in the other species. The perigone is lilac, a color that is absent in the other species (color range; from white, red, orange to yellow).

The bulb as a botanical concept concerns the perennial or persistent portion of plants with reduced stems, particularly of some Liliaceae and Amaryllidaceae. The bulb in the case of amaryllids, includes all of the plant excepting the roots that grow from the basal portion, and the leaves and scapes that protrude from the apex of the intermediate portion made up of a greatly reduced stem surrounded by living leaf scales (some Liliaceae), or enveloped toward the inside with living and toward the outside with dead bases of leaves and scapes. The principal parts of the bulb are the body and neck. The body is usually thickened and includes the basal portion at the bottom, continuing as a reduced stem with the main growing point at the top, and surrounded by living and dead leaf and scape bases. It may also include immature flower scapes. If the living leaves and scapes are surrounded by dead leaf and scape bases to any extent above the thickened portion, this narrowed part is known as the neck. This part above the body must be persistent in order to be considered a neck. In *Ixiolirion* for instance the plant makes a tuft of leaves above the ground in late fall and winter, and produces a stem from the center of this rosette in the spring. Shortly after flowering in the spring, the stem dies and disintegrates to the apex of the bulb body.

Each year a new rosette and stem are formed. Here we have a case where the bulb is not necked, or is at least only temporarily necked. In the typical amaryllids, however, the presence of the persistent neck is not a rare occurrence. In the Blue Amaryllis we have an extreme case where the neck is out of all proportion to the body of the bulb, and in this particular this species is quite distinct from the other species classed under the same genus.

Apparently most of those who have flowered the Blue Amaryllis have attempted to cross it with other recognized species in the same genus. There are no records of any successes. The writer has attempted reciprocal crosses. That is, he has transferred the pollen of species and hybrids in the same genus (*Amaryllis belladonna* Linn. non Ait. et Herb., *A. reginae*, and various hybrid clones) to the stigma of the Blue Amaryllis. The reverse crosses were also attempted. He had no successes at all. Communications from others who have attempted similar crosses state that seeds have not matured. This apparently indicates that there is a physiological isolating mechanism that prevents any gene exchange between the Blue Amaryllis and the other species now grouped under one genus.

TABLE I
CONTRASTING CHARACTERS OF THE GENERA WORSLEYA
AND AMARYLLIS

Character	Genus Worsleya	Genus Amaryllis
Seed character	D-shaped, inner edge thinner than outer which is sunken and wrinkled.	Usually flat, disc-shaped, winged; rarely subglobose ¹
Number of spathes	4 (2 outer larger; 2 inner smaller)	2
Leaves	falcate	linear, lorate or petiolate
Bulb	neck very long	neck usually short, or lacking
Gestation period	Relatively long	Relatively short
Color of perigone	lilac	white, red, orange or yellow
Gene exchange	Apparently no gene exchange possible between Worsleya and Amaryllis ²	

After due consideration of the important differences between the Blue Amaryllis and the other species of the Genus *Amaryllis*, it is clear that the former is distinct and is a candidate for consideration as the basis of a separate genus. This fact was tentatively recognized by W. Watson as long ago as 1929, and later by Traub (1940) who proposed the Subgenus *Worsleya*. It now appears logical to elevate this Subgenus to full generic rank. On the basis of the evidence presented, the Genus *Worsleya*, with *Worsleya procera* as the type, is proposed. The name is given to perpetuate the memory of the late Arthington Worsley—that great Englishman who has so greatly influenced our modern outlook on the amaryllids.

¹ Species in the Subgenus *Sealyana* have subglobose seed Sealy, Bot. Mag. t. 9504; (Traub, 1938; Traub and Uphof, 1940).

² Within the Genus *Amaryllis* there is no gene exchange possible between the linear leaved section and the lorate-petiolate section. This physiological gap apparently indicates that these two sections, although morphologically similar, are not intimately related. The linear leaved section may prove to be more closely related to the genera in the Tribe *Zephyrantheae*. Further information on this subject can be obtained from a study of the chromosome morphology, a subject worthy of an academic thesis.



Worsleya procera (Ducbarte) Traub, gen. nov. Group of plants imported from Brazil in 1939 by Las Positas Nursery, Santa Barbara, Calif. (See *Herbertia* 9:213-214. 1942) Photo 1943. By W. M. James.



Worsleya procera (Duchartre) Traub, gen. nov. Close up of plant at left in Plate 245, showing character of fruits, about one-half natural size. Photo by W. M. James.

Genus WORSLEYA Traub, *genus nov.*

Syn. Subgenus WORSLEYA, Traub, Genus *Amaryllis*, Linn. ex parte, non Ait. et Herb., HERBERTIA (1939) 6: 118-119. 1940; Traub & Uphof, HERBERTIA (1939) 6: 147, 149. 1940.

Diagnosis.—Bulb ovoid, with a very long neck; leaves about 12 to 14, distichous, falcate; peduncle usually shorter than the leaves; umbel 4-14-flowered; spathe-valves 4, the two inner shorter than the outer two, exceeding the pedicels; perigone lilac, not starred at throat; tube very short; perigone-segments oblanceolate, acute; stamens much shorter than the perigone; stigma capitate; seeds D-shaped, inner edge thinner than outer edge which is somewhat sunken and wrinkled between the margins of the side walls.

Quite distinct from Genus *Amaryllis*, its nearest relative, from which it is isolated by a physiological mechanism that prevents crossing. Differs from Genus *Amaryllis* mainly in the following characters: (1) gestation period is more than two and a half times as long as in *Amaryllis*; (2) *Worsleya* has 4 spathes, *Amaryllis* 2; (3) the seeds are D-shaped and otherwise distinct from those of *Amaryllis*; (4) leaves are falcate as contrasted with linear, lorate or petiolate in *Amaryllis*; (5) the bulb has a very long neck as contrasted with a much shorter neck or its absence in *Amaryllis*; and (6) the perigone is lilac, a color not found in *Amaryllis*. Type species: *Worsleya procera* (Duchartre) Traub, comb. nov., syn. *Amaryllis procera* Duchartre (jour. soc. imp. cent. d'hort. 9: 425-438. 1863, t. 17.)

Genus WORSLEYA Traub, *gen. nov.*

Bulbus ovoideus, collo longo; folia ca. 12-14, disticha, falcata; pedunculus saepe quam folia brevior; umbella 4-14 flora; spathe valvae 4, 2 interiores quam exteriores breviores, pedicellis excedentes; perigonium lilacinum, fause non maculatum, tubo brevissimo, segmentis oblanceolatis, acutis; stamina quam perigonium multo breviora; stigma capitatum; semina D-forma, atra, margine interiore quam exterioriore tenuiore, margine exterioriore plus minusve depressa et corrugata.

Description of species ,

1. WORSLEYA PROCERA (Duchartre) Traub, comb. nov. ; syn. *Amaryllis procera* Duchartre, jour. soc. imp. cent. d'hort. 9:425-438, 1863. t. 17; Traub, HERBERTIA (1939) 6: 118-119; (1940) 7: 94-96. Fig. 51, Plate 177. 1941; (1941) 8: 82. Fig. 64. 1942; Traub & Uphof, HERBERTIA 5: 114-131. 1938; (1939) 6: 146-154. 1940; *Amaryllis gigantea* Ducharte (non van Marum), jour. soc. imp. cent. d'hort. 9:77. 1863; *Hippeastrum procerum* Lemaire, l'illus. hort. t. 408. 1864; W. Watson, The Garden, London, 1894, p. 350, t. 959; Baker, Amaryll. 1888, p. 50; Worsley, gard. chron. Lond. May 1929, pp. 377-379, figs. 188 and 189; Pam, jour. roy. hort. soc. LXVIII: 331-332. 1943, fig. 98; *Amaryllis Rayneri*, J. D. Hooker, Curtis' bot. mag. t. 5883.

DESCRIPTION.—BULB slender, overall length 0.5 meter to 1 meter; 13 cm. to 15 cm. in diam. above root base; tapering to 5 cm. to 7.5 cm. at apex; and 7.5 cm. to 9 cm. at the center of the root base, which may be as long as 15 cm.; LEAVES 12 to 14, distichous, falcate, 0.6 meter to 1 meter long, 4.8 cm. to 7.5 cm. wide at center, firm in texture, cartilagenous at the edges; PEDUNCLE compressed, two-edged, at first hidden in the center of the crown of the bulb apex but elongating ultimately to 30 cm. to 45 cm.; 4.5 cm. to 5 cm. wide; SPATHES 4, the two outer 17 cm. long by 5 cm. wide; the two inner 7.5 cm. to 10 cm. long; PEDICELS 8 cm. long, triangular in section; OVARY 1.3 cm. long, ovules many; UMBEL 4 to 14 flowered; PERIGONE 14 cm. to 16 cm. long, TUBE very short, SEGMENTS lilac, not starred at throat, 12 cm. to 15 cm. long, oblanceolate, acute, 2.5 cm. to 3 cm. wide; PARAPERIGONE, none; STAMENS much shorter than the segments; ANTHERS yellow, 1.3 cm. long; STIGMA capitate; FRUIT a capsule, 1.3 cm. long, 2.5 cm. wide, loculicidally 3-valved; SEEDS D-shaped, jet black, inner edge thinner than outer edge which is somewhat sunken and wrinkled between the margins of the side walls.

HABITAT.—Organ Mountains, near Petropolis, Brazil.

NOTES.—The above description is based on the descriptions by Baker (1888), Major Pam (1943); on Figs. 51, 64; Plates 112, 177, 190, 239, that appeared in HERBERTIA, and data recorded by the writer in 1940 when a specimen of *Worsleya procera* bloomed for him.

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AMARYLLID GENERA AND SPECIES

In this department the descriptions of amaryllid genera and species translated from foreign languages will be published from time to time so that these will be available to American and British readers.

Genus KLINGIA Schoenland

Rec. Albany Mus. (S. Afr.) 3: 178-181. 1919. Figs. 1 & 2.

Bulbiferous herb, the bulb tunicate. Leaves numerous, late maturing, narrowly linear, enlarged and sheathing at base. Flower solitary. Perianth persistent, the tube long, slender, scarcely widened at apex, the lobes in 2 series, subequal, oblong-lanceolate, suberect. Stamens 6, in one series, affixed in the perianth throat, much shorter than the perianth lobes, the filaments free at apex, otherwise united among themselves and

with the perianth, the anthers attached basally, spirally twisted in flower. Style filiform, a little longer than the perianth tube, the stigmas short, obtuse. Fruit unknown.

Related to *Gethyllis* L., from which it differs in the filaments being united to each other and to the perianth.

Genus CHOANANTHUS Rendle

Jour. Linn. Soc. Bot. 38: 237-238. 1908.

Perianth narrow, funnel-shaped, the tube long, narrow, the throat naked, the lobes much shorter, broad, erect-spreading. Stamens inserted in the throat of the perianth, the filaments broad, narrowly triangular, acuminate at apex, the anthers oblong, versatile, affixed at the middle. Ovary 3-celled; ovules solitary in the cells, pendulous. Berry subglobose.

Choananthus Wollastonii Rendle, Jour. Linn. Soc. Bot. 38:237-238. 1908.

Rhizomatous herb, the leaves large, oval, many-nerved, narrowed at base into a contracted sheath; scape many-flowered (25 in our specimen), the flowers reddish-purple, falsely umbellate, finally recurved; bracts spathe-like, membranaceous, narrow, short; pedicel slender, shorter than the flower; perianth tube gradually enlarged upwardly, the lobes elliptic or elliptic-oblong, puberulous at the hooded apex; stamens scarcely equalling the corolla lobes; ovary ovoid.

Leaf blades 3 cm. long, 1 dm. wide; scape 3.3 dm. long, .5 cm. wide; pedicels up to 2.5 cm. long; flower 6 cm. long, the tube 4 cm. long, the throat about 1.2 cm. wide, the lobes scarcely 2 cm. long, 8-10 mm. wide, the interior ones a little shorter and more obtuse; ovary about 5 mm. long.

THE NAMING OF HORTICULTURAL VARIETIES

Under date of April 26, 1943, Mr. Donald Wyman, Horticulturist, at the Arnold Arboretum, Harvard University, Jamaica Plain, Mass., writes,—

“I am enclosing an article on ‘The Naming of Horticultural Varieties,’ [No. 2, Vol. 3, *Arnoldia*] which we believe contains *all* the necessary points essentially important. Many individuals who are experts in raising plants believe they are qualified to give new names to plants. This they can do—anyone can do—but in order to make the names ‘stick’ for all time, certain essential rules must be observed. Both botanists and the horticulturists agree on these. Consequently, the enclosed publication is of interest to *all* individuals who want to know ‘how plants get their names’ and particularly to those who actually give the new names.

These rules are simple and concrete. Everyone interested in American horticulture should be familiar with them and adhere to them. I sincerely hope we can do everything possible to assist American plantmen to conform to these rules.”

Anyone interested should write to Mr. Wyman for further information.—*Ed.*

REGISTRATION OF NEW AMARYLLID CLONES

Description of new clones of hybrid amaryllids for this section should reach the editor by June 1 if at all possible. Information sent after that date may be held over to the next issue if space is not available. This information is published to avoid duplication of names, and to provide a place for authentic recording of *brief* descriptions. Names should be as short as possible—*one word is sufficient*. It is suggested that in no case should more than two words be used.

At present there is a limit to the number of descriptions included from any one member. Hereafter not more than five brief descriptions of clones under each generic heading will be published free of charge from any one member in any issue of HERBERTIA. Additional descriptions will be published in the advertising section at regular ad rates. The first five descriptions will appear in this section and the excess will be continued in the section entitled, "Buyers Guide."

HYBRID DAYLILY (HEMEROCALLIS) CLONES

Trial Gardens. Cooperative daylily trial gardens have been established at (1) *Cornell University, Dept. of Floriculture, Ithaca, N. Y.*; (2) *University of Florida, Dept. of Horticulture, Gainesville, Fla.*, (3) *Southwestern Louisiana Institute, Dept. of Horticulture, Lafayette, La.*; (4) *Whitnall Park Arboretum, Milwaukee City and County Park Board, Milwaukee, Wisc.*; (5) *Texas Agricultural Experiment Station, Dept. of Horticulture, College Station, Texas*; and (6) *Des Moines Park Board, Des Moines, Iowa*. [Complete addresses are given under *Officers and Committees*, below.]

Introducers should send complete collections of hybrids to these cooperating agencies in order that the new daylily clones may be impartially evaluated.

HYBRID DAYLILY (HEMEROCALLIS) CLONES

Introduced by R. W. Wheeler, Winter Park, Fla.

Bobolink: A bicolor, medium sized, compact flower with very wide, frilled and creped petals of purple, a little deeper than Heliotrope (7814) of the Standard Color Card. Sepals are wide, golden yellow with a trace of purple dusting. The throat is greenish gold. The flowering stems are $3\frac{1}{2}$ ft., are multiflora, have proliferations and stand erect. A vigorous grower, having produced four flowering stems at two years old from seed. A recurrent bloomer in Florida. (See Fig. 95.)

Easter Morn: A large, compact flower with very wide sepals and petals. The ground color, throat and sepals are deep yellow. The petals are dusted a light brown, rich with a violet sheen which, together with a showy eye zone, gives life and character to this fine flower. The flowering stems are $3\frac{1}{2}$ ft., are multiflora and have proliferations. It is a recurrent bloomer and at two years old from seed had three periods of bloom, producing sixteen stems with more than 300 flowers.

Ganymede: Medium to large flower with flaring sepals of light sulphur yellow, slightly dusted. The petals are very wide, creped, frilled, tightly recurved and in color between Cornflower (6123) and Lilac (7163), both of the Standard Color Card. An unusual flower form in beautiful, delicate coloring. The flower stems are 2 ft.

Royal Lady: A bicolor with deep but bright violet purple petals, deepest in the center and shading to much lighter towards the tips and edges, with canary bands through the petal centers. The throat, sepals and high up on the petals is canary

yellow. The sepals are slightly dusted along the edges. The sepals are recurved, but the petals are somewhat flaring, pinched toward the tips and frilled. The flower stems are 2 ft. to 2½ ft.

Martha Washington: Compact and medium in size, wide sepals and petals, and a wide open flower. Sepals and petals are of the same color which is between Antique Ashes of Roses (2173) and Lilac (7163), both of the Standard Color Card. The throat is bright canary. Petals are frilled. The flower stems are 2½ feet.



Fig. 95. *Hybrid Daylily Bobolink*

Introduced by Dr. A. B. Stout, New York Botanical Garden, N. Y.

Elmer A. Claar. Height to 4 ft.; flowers medium full, medium size, throat near to cadmium yellow with stripe extending out along midrib of each petal; anthocyanin coloring in petals near garnet brown with more intense color in veins; ground color of sepals cadmium-yellow with areas of red pigmentation that are less intense than in petals. (See Fig. 93.)

Introduced by L. Ernest Plouf, Craemore Gardens, Lawrence, Mass.

Amber Gold, 3½ ft. July-Aug. A smooth amber-gold trumpet; wide deep gold throat; very smooth narrow outer segments; inner segments much wider with brown blotch.

Classic Beauty, 3 ft. July. A pale soft-toned variety; 5" open flower of smooth form and tailored crinkling; inner segments delicate rose-ecru veined deeper and crinkled; outer segments ivory and embossed-crinkled at edges; no eye-zone; canary throat; no twisting; opens very well; ivory reverses; long tube.

Chicaro, 3½ ft. July-Aug. Very full 6" flower flaring from narrow throat; orange-yellow; all segments crinkled at edges; good substance; inner segments 1¾" wide; triangular outline; outstandingly large and full.

Kickapoo, 2½ ft. Large deep red firmly formed flowers which look right at you; orange throat; inner segments well recurved; well open; good substance; good stem.

Lady Rockingham, 3½ ft. July. Rather smooth 6" well open trumpet; narrow canary throat framed soft rose; rest of all segments pale rose-ecru; outer segments a little lighter; ivory midrib at throat edge only; fragrant; quite full, well held substantial flower; good form. In its color-class unusual in fragrance, form and size.

HYBRID AMARYLLIS CLONES

Introduced by Hermon Brown, Gilroy, Calif.

Lawrence. Striped and spotted on white ground; opens flat; three nine inch blooms.

White Orchid. Pure white; whitish-green throat; segments informal; eight and a half inch flower reminiscent of a white orchid.

Gilroy. A large clear red eight inch flower; three blooms.

Salisbury. Red lines on light background; good form, flat, eight inch blooms.

Kansas. Dark red with darker glossy red throat; very beautiful; three eight inch blooms.

HYBRID NARCISSUS CLONES

Introduced by Edwin C. Powell, Rt. 4, Rockville, Maryland.

Iana. (No. 29/66, *Mrs. E. H. Krelage* X *Tenedos*) White trumpet of beautiful form and substance; large upstanding flower with broad, flat perianth segments; beautifully proportioned trumpet. See Fig. 97. To be introduced in 1945.

Niantic. (32/348, *Minuet* X *Lord Wellington*, pollen parent) High quality Poeticus, with one, sometimes two, flowers on the tall scape. (See Plate 248.) To be introduced in 1944.

HYBRID CYRTANTHUS CLONES

Introduced by Mrs. J. Norman Henry, Gladwyne, Penna.

Coral Reef (H-1), *Cyrtanthus MacKenii* x *C. parviflorus*; large flower, fine form; coral red, paler face.

Fairy (H-2), *C. MacKenii* var. *Cooperi* (*lutescens*) x *C. flammeus*; pale yellow, face edged palest coral pink; small flower, dainty and beautiful.

Venus (H-3), *C. MacKenii* var. *Cooperi* (*lutescens*) x *C. flammeus*; apricot with light yellow face, edged apricot; vigorous and attractive.

Red Gem (H-4), scarlet red, pink face; small flower of fine form; a real gem.

Topaz (H-5), *C. MacKenii* var. *Cooperi* (*lutescens*) x *flammeus*; coral orange, yellow face, unusual and attractive.

HYBRID CRINUM CLONE

Introduced by L. S. Hannibal, Concord, Calif.

Frank Leach. A horticultural variety of *Crinum Moorei*; flowers very light blush pink, larger than those of the type, remaining open all day; plant is more frost hardy than type.

3. CYTOLOGY, GENETICS AND BREEDING

EIGHTEEN YEARS' EXPERIENCE IN BREEDING NARCISSUS

EDWIN C. POWELL, *Maryland*

Although I began to grow *Narcissus* when I moved to Washington, D. C., in 1921 it was not until five years later that I began to cross them. The late Dr. David Griffiths, then in charge of bulb investigations in the United States Department of Agriculture, said to me: "Why don't you breed daffodils? What we need is American daffodils adapted to American conditions." I took up the challenge as it offered a much greater field for pleasure and relaxation from official duties than the mere growing of bulbs for their flowers.

Since then I have produced more than 55,000 seedlings. Probably 10 per cent of these produced high class flowers and plants, and less than one per cent were rather outstanding and worthy of introduction. The other 90 per cent have been good, many of them, in fact, better than the run-of-mine varieties in the trade. There have been practically no "weedy" flowers among them.

I acquired ten or twelve common varieties in the early twenties; imported five or ten bulbs each of 50 varieties in 1925, before the Federal Horticultural Board put the ban on the importation of most plants, *Narcissus* included, without a special permit for scientific purposes or the increase of stock. In 1927 I imported 70 varieties and each year since I have obtained a few of the newer introductions of foreign growers and breeders until I built up a collection of more than 400 varieties. Although most of those that I imported in 1925 have been superseded by later introductions I obtained some very good seedlings from *Monarch*, *Madam Plempe*, *Glory of Noordwijk*, *Minnie Hume*, *White Queen*, *N. cyclamineus*, *N. jonquilla*, and *N. triandrus albus* as pollen parents, and from the importations of 1927 *Aeolus*, *Bernardino*, *Empire*, *Fair Bostonian*, *Mrs. E. H. Krelage*, *Mount Erebus*, *Phyllida*, *Sirdar*, *Hera*, *Expectation*, *Kingdom*, and *Obvallaris* gave some worthwhile things. Except for the three species mentioned none of the others has been used for many years, although I hope to repeat next spring the cross of *Aeolus* on *Kantara* which gave me the finest white trumpet that I have ever seen. After increasing the stock to four bulbs it died.

I have used *Fortune* quite extensively as a pollen parent, but while it has produced a few seeds they have all failed to grow to flowering bulbs. *Fortune's* most highly colored seedling, *Fortune's Crest* from *Seraglio*, has been a good seeder and its pollen is very potent. I have several good seedlings from it, as well as from *Bokhara*, another *Fortune* seedling. One of the most successful early crosses was *Fortune* on *Bernardino*. There were many beautiful flowers in the resulting batch of about 40 seedlings from which I selected *Forber* and *Pocahontas* for introduction, both yellow *Incomparabilis* with highly colored crowns.

Many of the high-priced novelties have failed as breeders, at least in the combinations that I have tried. Some varieties are nearly or completely sterile in my garden. *Croesus* produced only one seed in several

years of crossing; *Warlock*, which was highly recommended for breeding, failed to produce any seeds (although its pollen was potent) until I had used it for more than ten years and then it seeded abundantly. *Seraglio* and *Therapia* have been very useful. Last spring I selected for further test some very highly colored flowers of good form and substance from *Will Scarlet* x *Seraglio* and *Seraglio* x *Fortune* crossed in 1937, but it

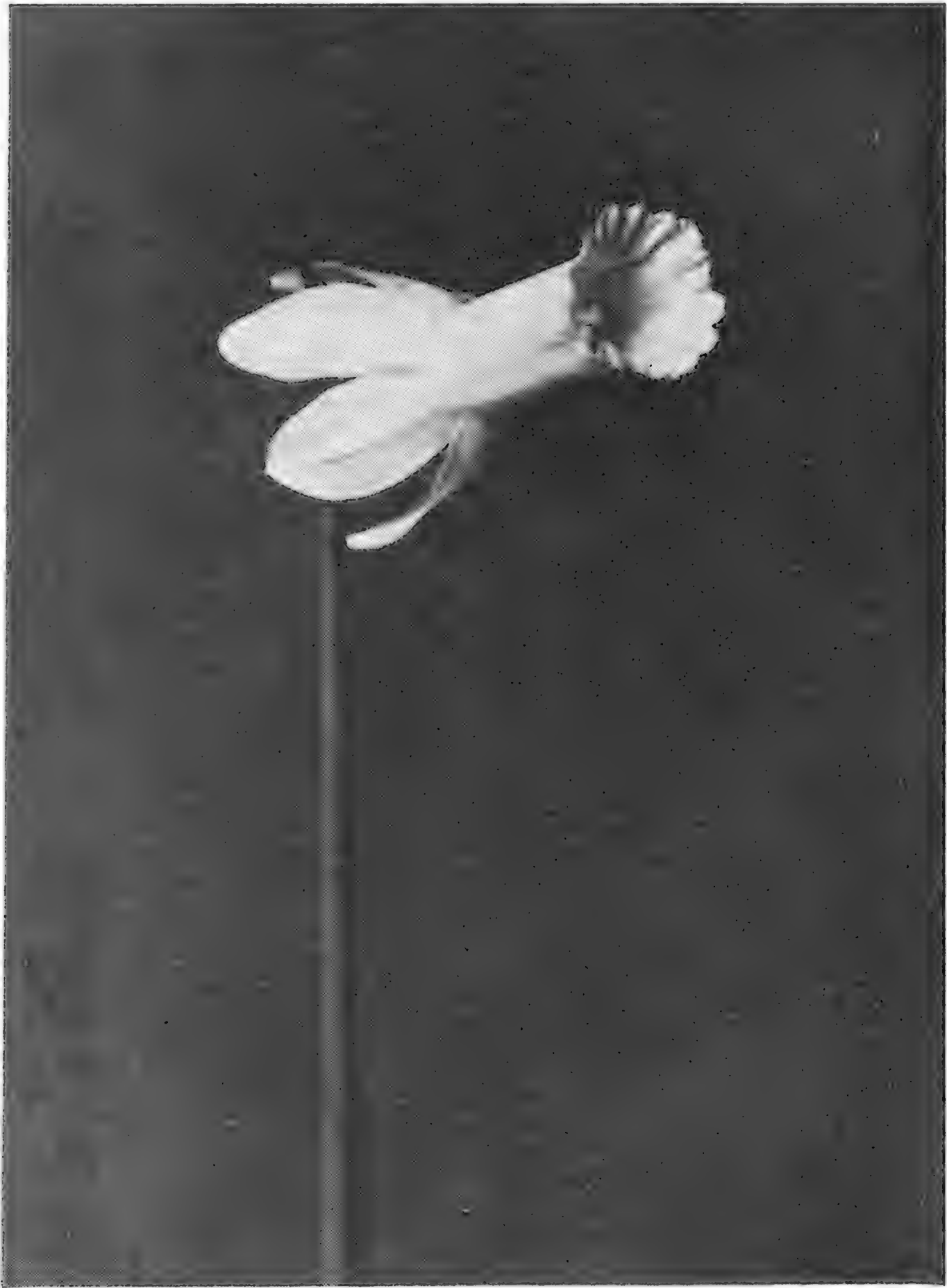


Fig. 96. *Narcissus ovallaris-cyclamenius* hybrid—*Chicopee*. Introduced by Edwin C. Powell.

will be several years before their value is determined. *Hera* x *Fair Bostonian*, two fine old varieties, crossed in 1929 produced some outstanding seedlings from which *Esopus*, a bicolor *Incomparabilis*, and *Massasoit*, a yellow *Incomparabilis* with a richly colored crown, were increased and introduced last spring. Another very successful cross was *Nevis* x *Naxos*



Yellow Trumpet Narcissus — David Griffiths. Introduced by Edwin C. Powell in 1936.



Narcissus clones originated by Edwin C. Powell; left, *Poeticus—Niantic*, to be introduced in 1944; right, *Tri-andrus hybrid—Ocone*, introduced in 1939.

that produced *Agawam*, an early tall white trumpet. *Beersheba* x *Pilgrimage* produced something very unexpected—a beautiful lot of highly finished vigorous yellow trumpets from which it will take some time to select the best one or two.

I have dabbled a little trying to produce some pink-toned Leedsii varieties but have concluded that they are not well adapted to our climate. Most of the delicate colored varieties have been short lived, but *Mrs. R. O. Backhouse* has been very steady and reliable and its pollen on *Pinkeen* has given some beautiful flowers. Its pollen is potent but it is valueless as a seed parent.

My first introduction was *David Griffiths* (Plate 247), a fine, large yellow trumpet named for the late Dr. David Griffiths, who gave me 50 grams of seed from intercrossing *King Alfred*, *Van Waveren's Giant*, *Weardale Perfection*, and *Glory of Noordwijk*. It was the best among more than 300 seedlings. One of the most vigorous and prolific of my seedlings is *Tioga* from *Robert Sydenham* x *Pilgrim*—the only good thing from a lot of *Pilgrim* seedlings, a variety that has been highly useful in the hands of some English breeders. *Tioga*, a bicolor *Incomparabilis*, is in the same class as the popular *Bodilly*, but larger and more prolific. Three outstanding productions because of their form and size are *Hiawasse*, a Poetaz from *Cassandra* x *Cyclamineus*, *Chicopee*, (Fig. 96) a very early hybrid from *Obvallaris* x *Cyclamineus*, and *Oconee*, (Plate 248) a *Triandrus* hybrid whose seed parent is unknown, while from *Nevis* x *Godolphin* I got *Itasca*, a reversed bicolor trumpet having light yellow perianth segments and a creamy white trumpet. *Powhatan*, a yellow trumpet from *The Perfect Gentleman* x *Sunstar*, may be heard from later if it continues to be a good actor. It is very large and extremely vigorous, has splendid form, thick heavy substance, and is about the richest and darkest yellow of any variety in its class.

Alachua is an early fine large bicolor trumpet raised from a lot of mixed seed. It has broad flat well overlapping perianth-segments that stand at right angles to a shapely tubular rich yellow trumpet with a slightly frilled trim. It was shown as a first-year flower at the Annual *Narcissus* Show of the Garden Club of Virginia in 1940 and was given an Award of Distinction as the best variety not in commerce. It was awarded first prize as the best seedling and the best flower in the show at the Annual *Narcissus* Show of the Takoma Horticultural Club in 1943.

Oconee (Plate 248) is a late flowering *Triandrus* hybrid introduced in 1939. It is outstanding because of the decided contrast in color and unusual form. It bears two to three flowers on a stem; has a flaring light yellow crown, and white perianth pointing backward. *Iana* (Fig. 97; to be introduced in 1945) is a white trumpet of beautiful form and substance bred from *Mrs. Ernst H. Krelage* by *Tenedos*. It is a large up-standing flower with broad flat perianth-segments and a beautifully proportioned trumpet. *Niantic* (Plate 248; to be introduced in 1944) is a poet that usually produces one flower on a tall stem; sometimes two. It was bred from *Minuet*, one of the finest poets, and its pollen parent is recorded as *Lord Wellington*, a giant yellow trumpet. It is outstanding among a considerable batch of poets because of its high quality.

Triandrus albus as a pollen parent has produced several very beautiful flowers of characteristic form. Most are white but I have a few very attractive yellows and one or two bicolors, including the bicolor *Oconee*. The pollen of the species *Narcissus Jonquilla* is very potent and although most of the Jonquil hybrids are yellow I have obtained several attractive white ones.

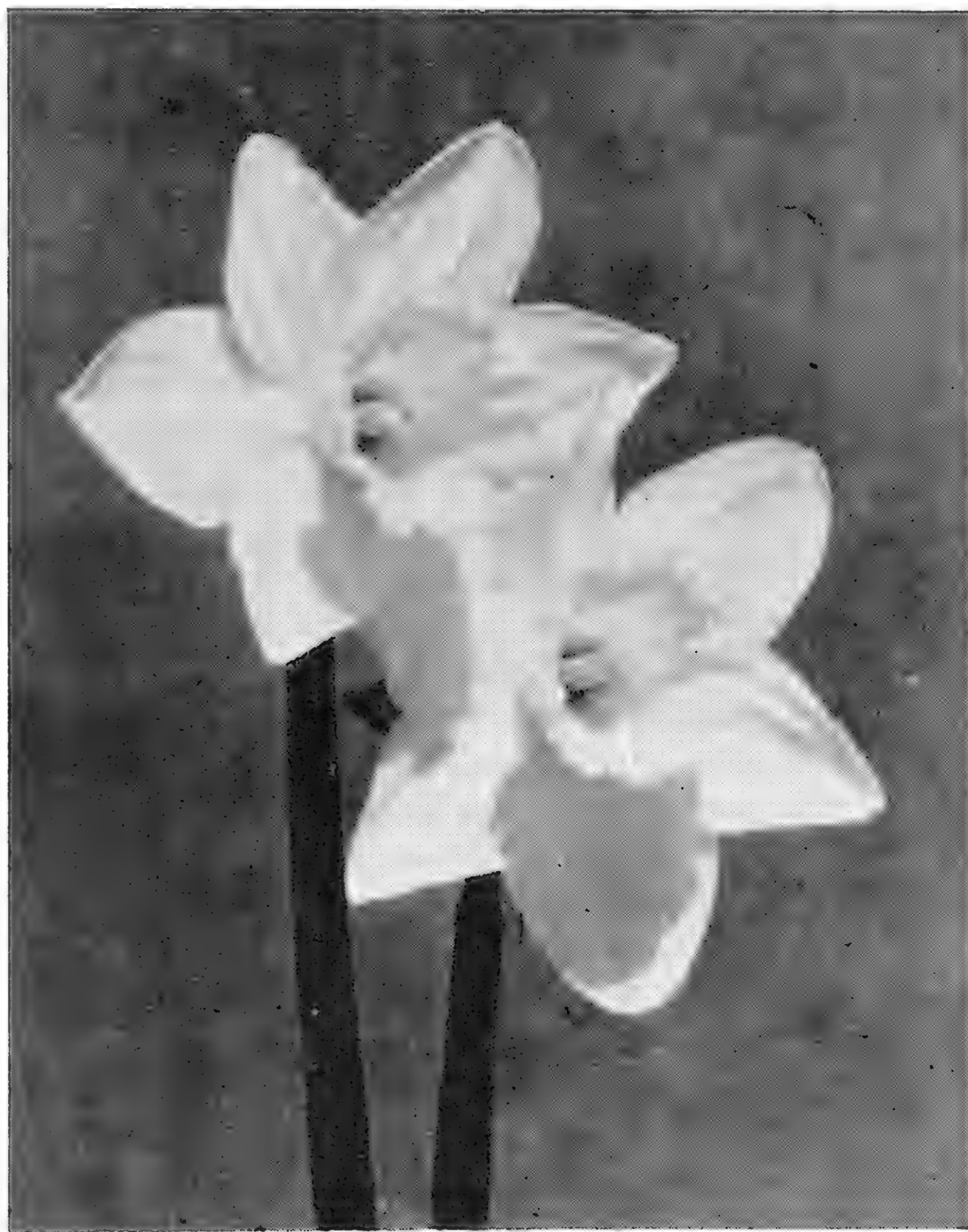


Fig. 97. White Trumpet Narcissus—*Iana*, to be introduced by Edwin C. Powell in 1945.

Soon after the first seedlings flowered I began to use them as parents and in recent years I have worked largely with my own productions. There are some worthy flowers in the second-generation seedlings, and a few of the third generation that have blossomed show a marked gain in one or more characteristics.

It requires from four to seven years to bring a seedling to flower and from four to six more years to determine the worth of the best of the few selected for trial. The breeding and production of seedlings is rather easy and simple, but a great amount of time and careful attention

is needed. Many combinations of parents are figured out in advance, but as many more are made on the spur of the moment because of the condition of the flowers—they do not all open when you would like to use them because the flowering period covers six to ten weeks. I select each fall ten or a dozen varieties that I wish to use and pot a few bulbs. They are plunged in the ground and brought into the house in March to obtain the pollen for use on earlier flowering varieties. Anthers are removed either as or before the flower opens and the pollen is placed on the pistil with a camel's hair brush or a pencil. A small price tag bearing the cross number is placed on the flower stem and the cross recorded in a record book. This number, preceded by the year (as 29/303) follows the seed and seedling until it is either named or discarded. The flowers are not covered because there is little open pollination in this climate.

The seed pods are gathered daily as they ripen and the seeds are counted and placed in coin envelopes into which are placed zinc or galvanized-iron tags, $\frac{3}{4}$ by $1\frac{1}{4}$ inches, bearing the cross numbers stamped into them with steel dies. During the summer or fall the seeds are planted in flower pots, each cross in a pot, and plunged to the top in a frame where they remain for two years. The frame is covered with glass sash in February to prevent the tiny plants from being heaved out by the alternate freezing and thawing.

After the end of the second growing season the pots are lifted, the contents dumped into a wire screen, and the small bulbs and metal tag picked out. Before the general planting season begins the bulbs are planted in rows a foot apart, the tag being hung on a No. 12 wire which is placed before each lot. Here they remain for four or five years until nearly all have flowered and the most promising have been marked, dug, and planted for further observation. Bulbs that have not blossomed by the sixth year have not produced any high class flowers after being dug, replanted and tested for a longer period. Less than one per cent blossom during their fourth year; about 50 per cent in their fifth; and 95 per cent or more the following year. It is a long wait from the crossing of two flowers to observing the final result in a new flower, but each spring as hundreds of new ones open there is keen anticipation and unbounded happiness in observing the efforts of one's skill and patience.

NARCISSUS BREEDING

FRANK REINELT, *California*

Ten years of breeding daffodils makes me only a seasoned beginner at the game, so my remarks and ideas are only partly from my own experience—the greater part are drawn from the experience of other more advanced breeders.

The great progress in daffodils in the last two or three decades was due to years of patient work by English amateurs, of whom the quartet, G. Englehart, Mrs. Beckhouse, P. D. Williams and Brodie of Brodie, were the most outstanding. All four are gone today but they left us a magnificent collection of material with which to continue the work.

Englehart gave us the advancement in white trumpets, Leedsii and Poets, among other things. Mrs. Backhouse brought color in red cups to an enviable intensity. P. D. Williams was responsible for the finest daffodils practically in every division. Brodie of Brodie was the most versatile, as his creations were most numerous, covering all of the forms and types.

At the present time, Guy Wilson and Lionel Richardson, both in Ireland, are sharing the honors of bringing out the finest new varieties. From Australia, New Zealand and Tasmania, various breeders have brought out excellent varieties; their chief contribution is perhaps the variations in pink cups of the Leedsii Division.

American breeding is still in its infancy, since it takes a lifetime to really accomplish anything in the breeding of daffodils. Advanced new varieties only recently began gaining more popularity. Our diversified climatic conditions present the difficulty to a breeder of producing varieties which would be adaptable for every condition. Our most ideal growing conditions, corresponding with the English climate, are in the Pacific Northwest. Unfortunately, the majority of the gardening enthusiasts do not live in that part of the country and cannot obtain equally good results in growing most of the varieties. For instance, here in California the very early varieties do much better than the late Barrii and Poets. Our season is too long, beginning in January with early varieties and ending in April with the late Poets. The sun during March or April is too warm to bring out their color so that they seldom look at their best. On the other hand, Eastern conditions, where early varieties often freeze in bloom, assure much better results with late varieties; and under some climatic conditions where long winters prevail, all of the varieties bloom practically at the same time, making the season extremely short.

From my point of view, the future breeder should consider several cardinal points, of which vigor and resistance to diseases, are the most important. Hundreds of perfectly beautiful varieties were introduced in the past, but disappeared from commerce very rapidly because of a delicate constitution. Basal rot, for which the tendency is strongly inheritable, eliminated for me a number of the finest white trumpets now in existence. Englehart's *Naxos* and Brodie's *Askelon* were perhaps responsible for the greatest advance in white trumpets recently, but both have the fault of inheriting a tendency for basal rot. *Askelon* never survived for me the first year. *Naxos* seems to linger for a while at least. They may be perfectly all right in very cool climates, but they are decidedly not for California.

Length of stem, short neck with good carriage, are next in importance. A flower which stands above the foliage on a strong stem with a short neck is more pleasing than one which bends down due to a long neck. It will stand rain and wind much better and will be more effective in the garden. In the matter of the flower, good form, balance and quality are very important, as well as color. There is no restriction as to variation of form that one has to adhere to. The Royal Horticultural Society dimensions for each type should not necessarily obstruct the

breeder's point of view. Too many varieties look too much alike and greater variations in the form of the cup, particularly, would make the distinction easier.

Color in daffodils is considerably limited, although the variation has been extended steadily with each new advance. One should strive both for the white or yellow in the perianth with more clearness and intensity. Too many varieties have muddy perianths with indistinct and variable shades of cream or light yellow. It is desirable to strive for greater variation in color of the cup. We already have cups of every shade of yellow, orange and red, which, in the case of *Hades*, is very deep. Unfortunately, the large red cups are more or less combined with perianths that are not white but cream in color at their best. Only a few flowers so far have the whiteness of perianth seen in the Poets. The work with red cups combined with yellow perianths is more advanced as there are a number of varieties with very good color contrasts already. A large possibility for beautiful color combinations is in the Leedsii class. An example is to be found in the recently developed pink cups. Not very much has been done with the Poets since Englehart, and his creations are still some of the best in that class. I am personally interested only in the first four classes; namely, trumpets, incomparabilis, Barrii and Leedsii. Therefore, I am not mentioning the other classes. Since I live in California, naturally I am judging according to our conditions and prefer varieties which do well with us. The subject is too large to be handled by one breeder and each locality presents an opportunity for developing something else. My own ideas about a good flower do not necessarily correspond with others', and are by no means a measure of any standard.

During the last ten years I have tested or have seen elsewhere the majority of the best English products, some of which impressed me a great deal, others again not at all. I shall chiefly name the newer and latest varieties in each class, since older varieties, long-established in commerce, have practically no breeding value any more.

The yellow group of trumpets and incomparabilis are perhaps the most difficult to breed. *Crocus*, *Cromarty*, *Principal*, *Royalist*, *Trenoon*, *St. Issey* and *St. Egwin* are my choice of breeders. All of them more or less proved of fine breeding value already. *Mortlake*, an Australian product, impressed me as a possibility. I have not had enough experience with *Kilkenny*, *Kingscourt*, *Galway* and *Portmarnock* to pass judgment on them. All of them do comparatively well. *St. Issey*, the earliest of the lot, has also the tallest stem, which is important here since most of the varieties do not produce sufficient length of stem, especially if the winter is comparatively dry. *Royalist*, the latest of the group, is often quite short; however, it has a good carriage, fine form and very, very fine smooth quality, which it transmits to its seedlings; the best example of this being, perhaps, *Kingscourt*, judged in England the finest and deepest trumpet yet produced. Heavier substance, wider perianths are the chief pending improvements in this class.

In the white group, I have combined both the white trumpets, incomparabilis and Leedsii, since they can be bred as a group, the difference often being only small measurements in the length of cup, or

parentage. The true white trumpets are comparatively short here and none too vigorous. I have been continually losing such things as *Askelon*, *Cameronian*, *Slemish*, *Beersheba*, so that I more or less decided to get away from their progeny when possible. They may be perfectly good to breed with in more adaptable climates. *Trostan* although an *Askelon* seedling, seems to have inherited from *King Alfred* more vigor, *Kanchenjunga* proved of enormous value in breeding already; and third, their child, *Broughshane*, from all indications, seems to be the biggest advance in white trumpets so far. *Samite*, I consider very important since it was raised from *Mrs. E. H. Krelage*. For superfine quality and finish it has only a few equals. *Polindra*, which is classed as incomparabilis, I like perhaps best of any daffodil. It is the nearest to perfection in every way. It does magnificently with us and should prove a very valuable parent. *White House*, bred from *Nisa* and *Tenedos*, is very promising, very early, tall, white. *Zero*, as pollen parent, is proving of value, and certainly it is the whitest flower I have seen so far. In combination with these whites, *Brunswick*, which actually has a lemon ring to the trumpet, has great possibilities.

Another group of whites from the Leedsii class, with possibilities of color in pink, copper and buff tones in their cups, is perhaps the most exciting to me: *Carnlough Penvose*, *Trousseau*, *Pink of Dawn*, and *Cleena* are the finest examples I have seen so far. *Niphetor*, which proved of fine breeding value in England, is very short here in California, and perhaps out of *Polindra* one might get the same results with much taller stems. *Cleena*, a seedling from *Fortune* (therefore an incomparabilis), should be of very great value. It has inherited the smooth bulb of *Fortune*, a strong, tall stem, and a very short neck. I do not mention the late Leedsii with pink cups bred from *Mitylene* or *White Sentinel*, which die out rapidly with us. All of *Mitylene*'s progeny are quite weak in California, although it is a good flower in other localities.

Yellow or red flowers do very well with us as they are earlier and have more vigor. *Fortune*, I still consider worthy of breeding, although only a few really outstanding varieties were raised from it, such as *Cleena* and *Hongkong*. If one could transfer the vigor, type of bulb, and size of flower of *Fortune* to the other red cups, one would make a great advance in breeding. *Carbineer* gave some of the best recent yellow and reds, of which *Narvick*, bred from *Carbineer* by *Porthilly*, is best. *Penquite* is another good breeder, due to its very short neck and very wide perianth. *Bahram*, its child, is a perfectly beautiful thing. *Diolite* is a very good flower. *Porthilly* has a very intense cup. *Royal Ransom*, with its buff perianth and *Market Merry* with a strong contrast of gold and red, should be included.

The group of white perianth flowers with color in cups is bewilderingly large. Unfortunately, they bloom late with us and the strong sun burns the color and generally they are not any too vigorous. *Blarney*, *Flamenco*, *Forfar*, *Hades*, *Jean Hood*, *Limerick*, *Rewa*, *Rubra*, *Seraglio* and *Therapia*, at present, are the chief varieties I have chosen. *Jean Hood*, an Australian product, is the earliest red and white flower, also the tallest daffodil I know of. It should be important for combining white and red flowers with early flowering, which, in California, means

a lot. At that season the color develops perfectly without fading or burning. *Rewa*, although not a large flower has a very tall stem and again is quite early. Bred from *Bernardino* by *Fortune*, it should give new color combinations in the cups. *Rubra*, another Australian product, is actually a short crown *Leedsii*; however, it can be included in this group as it too has a tall stem, is vigorous, and has a very smooth, round flower. *Seraglio* transmits its heavy substance, and some very fine seedlings have come from it. Its sister seedling, *Therapia*, is extremely large for a *Barrii*, quite important as a pollen parent. *Flamenco* does not burn and is very vigorous. *Hades* has the strongest red color in cup, which it transmits freely to its progeny. *Blarney*, bred from *Mitylene* by *Sunstar*, both of which are very difficult to breed in California, seems to be the exception to the rule and grows quite freely. It is a beautiful flower with a novel coloring in the cup showing new possibilities in combinations of color for the future.

In conclusion, I should like to stress that I mention only the varieties that did well with me so far and which I choose in each respective class for my work. When one traces the parentage of the best new varieties, it seems to narrow down to a very few original parents. Some parents occasionally produce good flowers, but on the whole they are too defective. Therefore, I choose without regard to class and try to limit the number only to the few which eventually will bring home the bacon. If one uses a large number of varieties of secondary quality, one at least can expect only second quality progeny.

It takes, as a rule, five years to raise one generation and the beginner should regard the first two generations that he raises as an education before he can hope to produce something worth while. Unless the product will have combinations of all the factors which make it either an excellent garden variety or commercial cutting variety, there is not much sense in introducing it as it will not survive the competition. No matter how beautiful a flower otherwise, if it lacks propagation ability or is subject to diseases, it is valueless to the gardening society at large. Each year I see disappearing from the catalogs a number of varieties that are superseded, but there are also old-timers that seem to withstand the competition very well and stay on and on. What we need is such varieties possessing practically cast-iron constitutions, wider range in color and form of the cups to make them more distinctive.

RAMBLES IN THE NARCISSUS SEEDLING BED, 1943

S. STILLMAN BERRY, *California*

Since the informal report on my work which appeared in the 1942 Daffodil Yearbook was written (1940) three springtimes have transpired in my garden, all good ones for *Narcissi* and one of them quite outstanding for the number and quality of the blooms. Each season has brought its little measure of further progress in the breeding of interesting flowers and it is of this that I would now briefly write. It is of course a constant goal of breeders in southern California to attain flowers of intense coloring reasonably adapted to persistence in our dry air and brilliant sunlight. I believe my early feeling is already being amply

borne out that progress in this direction is likely to be much surer by the method of direct selection from seedling plants grown on the spot than it is when one relies only on the costly system of trial and elimination of varieties developed elsewhere and already subjected to selection under quite other environments. In fact it increasingly appears that resplendent crowns which hold up under any but the most unreasonable onslaught by sun and wind are much more rapidly attainable in the seedling beds than smooth, finely formed perianths, or even perfect carriage. That matter of carriage is often, indeed, even more troublesome than the perianth. Quite a number of the named varieties of daffodils which are among the most potent in the way that they distribute high color and gorgeous patterns amongst their progeny are incorrigible offenders in the way they transmit too long or awkwardly attached pedicels. I do not deny that flowers exist which are still graceful despite quite long pedicels, while others with much shorter "necks" may yet be ungainly because of the awkward angle formed where the pedicel springs from the scape. When the pedicel is both long and inserted at a bad angle, it becomes a breeder's nightmare. One can attempt to deal with such flowers in one of two ways,—either reject them from the breeding stock, with the deliberate sacrifice of such more desirable genetic traits as the plant might appear or be presumed to carry, or attempt more patiently to screen out the bad and propagate the good qualities through successive matings. In practice I find myself no consistent dogmatist in this, adopting now one procedure, now the other.

I have made this rather trite digression into the field of general principles to pave the way for an interesting concrete illustration, the old daffodil *Brightling* having revealed itself as a rather trying instance in point. Its own neck is not too good, but earlier in my breeding work I was for a time rather poor in flowers of highest color, so resorted to this in one series of crosses. Several hundred seedlings resulted, most of which, as chance had it, came into bloom in near proximity to one another. If one yearns for a springtime introduction to the fireworks of Independence Day I know of no very much better way of attaining it than to grow a batch of *Brightling* crosses. My own display of red fire, Bengal lights, and Catherine wheels was visible from as far as one could distance one's self from the bed, but it was as though a chance match had fallen into the box—they shot off at all angles and in all directions. There was no denying the color, however, all the parents grouped together could not have equalled the show—but never in all my seedlings, outside of *N. triandrus* var. *albus* hybrids, have I seen so many gawky pedicels. Nine-tenths of the lot could be eliminated at once, and mostly through this fault alone, yet I could not bring myself to make a clean sweep and I confess that I have since been breeding pretty heavily from two or three of the ultimate selections—a bad mistake, perhaps—but time inexorably will tell, and it would be worth much to contrive one of those flaming bowls against a perianth with the poise and fine formation of a *St. Egvwin* or a *Carnlough*.

The desirability of smoothness of perianth further complicates the task. It is the easiest thing in the garden to breed flowers of high color if one will rest content with the coarse ragged perianths which so detract

from one's pleasure in many of the most spectacular flowers enjoying present acclaim, and which abound in many of the broods from what otherwise would appear the most promising of crosses. We know the complete lineage of so few of the flowers we must use that it is often quite impossible to predict about this in advance and only the actual experiment reveals upon its completion whether the marriage has been well advised. Some years ago when the famous *Fortune* was scarce in America and I had but a flower or two of it, I thought I would like to know the result of matings within the strain, and chose for this purpose the two smoothest-petaled of the *Fortune* seedling then in my garden, *Bokhara*, which is said to come from *Fortune* on *Tamarlane*, and *Copper Bowl*, which is given as a *Fortune-Beacon* cross. A heavy seedling resulted and in the end more than a hundred plants of this parentage were raised. A monotonous lot they were. I had expected a fair production of flowers throwing back somewhat strongly to the double ancestor *Fortune*. However, the great majority were simply poorer, rougher *Copper Bowls* or *Bokharas*. The lot ran 2a throughout; the uniformity in color, a yellow perianth with the crown some tone of orange, was marked. Conspicuous depth of color was a feature of the minority, and in the entire batch only a very few flowers proved in any way outstanding. If my experience extended no further than this lot I would be inclined to look with small favor upon the further use of either parent, but fortunately a number of out-crosses had been made with each of them at about the same time and the story of some of these is quite different. In the article I have mentioned something has been said of the happy consequences of the reciprocal matings made between *Bokhara* and the Australian *Warflame*. Another essay nearly as interesting has been the pollinating of *Scarlet Queen* by *Copper Bowl*. A lot of pretty rough flowers might be expected here and I got them, but a fair proportion turned out reasonably smooth. There was plenty of fine color, one flower in particular unfolding a large bowl-shaped crown of intense flaming scarlet which will surely bear watching both in its own right and for use as a parent. I have used the pollen of this brilliant flower to its utmost capacity and have harvested seeds by it from *Carbineer*, *Marksman*, and *Telopea*, all of which seem somewhat hopeful possibilities.

A less spectacular but not less interesting result, providing the scratching of birds in the seed pans did not effect an unpremeditated interchange, came from a back-cross of *Bokhara* on *Fortune*, where a small batch of seedling plants, most of which revealed strong *Fortune* influence, included one very trim and handsome yellow trumpet. *A priori* one would think that the recovery of 1a flowers where both parents are 2a and therefore each possesses trumpet blood, might be frequent in the progeny, but in practice it seems a strangely uncommon event, for which we may need a carefully controlled genetic analysis adequately to explain. I have noted such a revision only two or three times among my seedlings, and the same holds for white trumpets coming from interbred 4a's. I read with no little envy of the increasing occurrence in some numbers of flowers with pink or pinkish crowns in the seed-beds of other growers, where they seem frequently to crop out from the most unexpected combinations. To date I can report little luck in this direction, and it has been only this past spring that my first flower of a

definitely pinkish tone reached blooming age. It resulted from rather a surprising cross and has served as a spur to jaded hope, though it is only fair to mention that all of the most promising of my really planned "pink" matings are still to come on. The plant referred to is a seedling of *Zoe* by *Fortune*, its white perianth rather starry in form like that of its mother daffodil, but the rather short, bowl-shaped crown a somewhat orange-salmon tone throughout. *Zoe* is an immense, rather narrow-petaled 2b of Australian origin, much like a considerably amplified and glorified *Bernardino*, of which old-time standby I am informed that it is in its turn a derivative. I presume this seedling would be classed as a 2b, but it is pale for that and the step required to take it into 4a or even 4b would not be a stride. I used pollen of Mr. Guy Wilson's beautiful *Carnlough* on the single flower, harvesting therefrom five seeds.

I would like to add a few words about green-eyed flowers, but the space allotted me has by now been filled and it is as well to leave something for next time.

STEPS IN PRODUCING HYBRID NARCISSUS¹

KENYON L. REYNOLDS, *California*

1. As a flower starts to open the anthers are removed with a small pair of forceps. This makes chance pollination very unlikely. The flower is then left for about three days, when it is ready to receive the pollen from some other flower. (See Fig. 98, upper left.)



Fig. 98. Steps in Narcissus breeding: upper left, step 1; upper right, step 2; lower left, step 3; and lower right, step 4. See text for details.

2. If it is desired to save the pollen for use on other flowers, the anthers when removed should be placed in an open container of some kind, like a small vial, watch-glass or piece of tin-foil where it can be exposed to the drying action of calcium chloride in a cookie-jar or similar container. If such a dessicator is not available the anthers should be

¹ This note, and also the illustrations accompanying it, are reproduced by permission, from page 56, *Sunset Magazine*, March 1940, Lane Publishing Co., San Francisco, Calif.

placed in the shade in the open air until the pollen “comes up” and appears in the form of yellow powder on the anther. (See Fig. 98, upper right.)

3. When the flower has been open a couple of days the dry anther from some other variety is taken in the forceps and the pollen is applied to the stigma which can be easily found in the center of the flower. (See Fig. 98, lower left.)

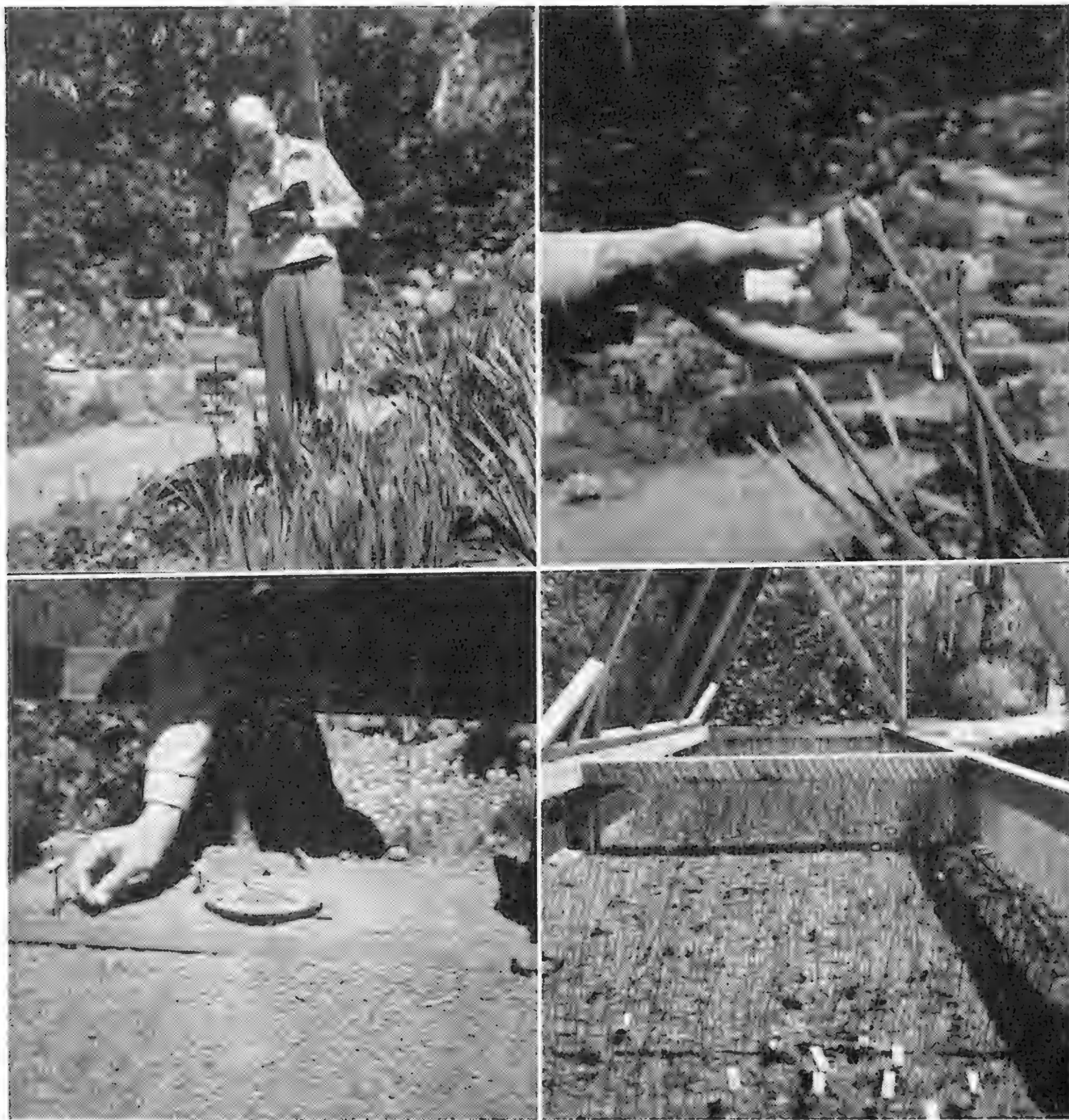


Fig. 99. Steps in Narcissus breeding (continued): upper left, step 5; upper right, step 6; lower left, step 7; and lower right, step 8. See text for details.

4. A tag with the number of the cross is then tied around the neck of the flower tightly enough so it will not slide down the stem. (See Fig. 98, lower right.)

5. The name and number of the cross is then recorded in a note book which is kept for permanent reference. (See Fig. 99, upper left.)

6. About two months later the seed-pod should be watched. If it rattles when snapped with the finger, it should be harvested and the seed placed in an envelope marked with the name and number of the cross. (See Fig. 99, upper right.)

7. The seeds should then be planted about one inch deep in soil which has good drainage and has been enriched with some bonemeal. They may either be placed in the open ground in the place where they are to be left to bloom, in which case they should be at least one and one half inches apart each way; or they may be planted much closer in a frame or box (not a flat) and transplanted after they go dormant at the end of the second year. Planting may be done immediately or at the end of the summer. (See Fig. 99, lower left.)



Fig. 100. Steps in Narcissus breeding (continued): step 10. See text for details.

8. In December or January the first leaves will appear above ground. The ground should be kept fairly moist from then until the leaves die down in June or July. The second year they will reappear with two or more leaves which will be larger and flat as seen in the rear frame in this picture. (See Fig. 99, lower right.)

9. About twenty five to fifty per cent of the seedlings will flower in the fourth year.

10. Most of the remainder will flower in the fifth and sixth year and from then on they are treated like any other bulbs of new varieties.

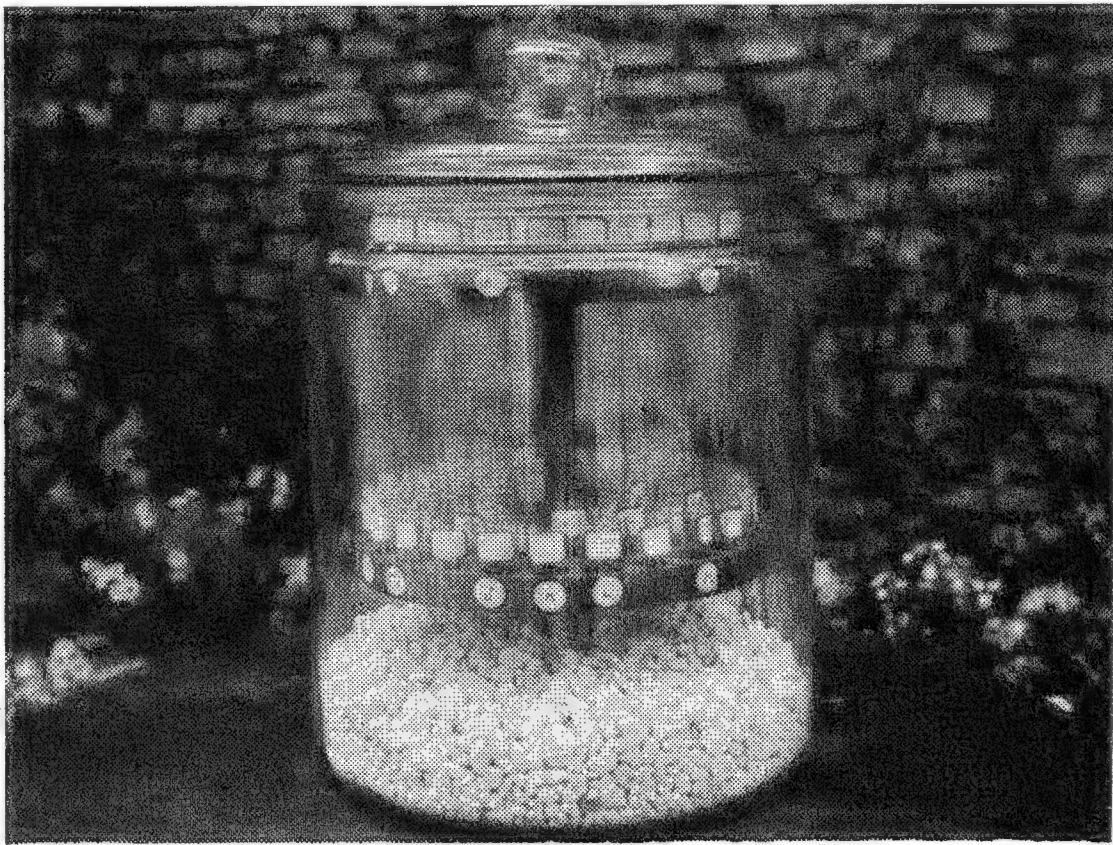
NARCISSUS FROM SEEDS

KENYON L. REYNOLDS, *California*

Narcissus are easily grown from seeds and do not require expert handling or special equipment. Furthermore, bulbs grown from seeds will almost invariably be healthier and more vigorous than any which can be purchased. Each bulb grown from seeds will be a new variety

and no two will be exactly alike, but once a bulb has flowered it may be perpetuated by propagating the increase from that particular bulb. The only negative consideration is the time required from seeds to first bloom. This is usually four years. The procedure is as follows:—

If plenty of space is available it is a little less work to plant the seeds where they may be left in one place for the entire time from seed to bloom. If garden space is a consideration it is advisable to plant the seeds in a frame or boxes or large pots. The soil in any case should be at least 8" deep. Any garden soil will do. If the drainage is not good it should be improved by adding peat and sand. Bone meal and wood ashes may also be added, an ounce or two of each to the square yard, but they are not necessary. Other fertilizers are not recommended.



*Fig. 101. Desiccator for preserving Narcissus pollen.
See preceding article for details.*

The seeds may be planted at any time after they ripen in May or June, but should be in the ground by mid-October at the latest. Cover the seeds with about an inch of soil. A quarter inch of peat on the top is desirable but not necessary. In pots, arrange the seeds at least one half inch apart. In boxes or frames plant in rows 3" apart but the seeds may be as little as one fourth inch apart in the row. If the seeds are planted where they are expected to mature they should be 1½" apart in the row and the rows should be 6" apart.

It will add greatly to your pleasure if the seeds from each cross are kept separated and carefully labeled. If you are trying them for the first time it may not seem important now, but you will surely regret it if you do not know the cross when blooming time comes. Remember, when making the labels that they must last for six years or more.

Water sparingly until October 1st. After that supplement the rains with frequent watering. Keep the weeds pulled. The plants will appear above ground between December and February depending upon the lateness of the variety. The first year they produce a single round leaf which may grow six or eight inches long. If watering is not neg-

lected they will continue to grow until early summer. Then they will turn yellow and die down. The dead leaves may then be removed and watering practically stopped until the following October, but it is well not to let the soil remain powder-dry if an occasional light sprinkling is practical.

The cut-worm is about the only enemy of these plants during their first two years. They eat the leaves from the top down and if not checked they may destroy a whole year's growth, but seldom kill the plant. If their presence is observed the plants may be sprayed with an arsenic coating spray. The safest procedure however is to go out after dark with a flashlight and gather the worms. They will almost always be found at the top of the leaf and at first they are very small, perhaps less than a half inch long and only as thick as the lead of a pencil, but later they are easy to find. Usually they can be eliminated after a few nights attention.

The second year the plants usually have two or more leaves of the characteristic shape and coloring of daffodil foliage, but they seldom exceed a quarter inch in width and a foot in length.

If the seeds were planted in close quarters, the little bulbs should be dug at the end of the second growing season. They will be found to have drawn themselves down so the bottom of the bulb is about four inches under ground. The bulbs will be about the size and shape of peanuts or smaller and usually have one or more fleshy roots attached. They should be planted back without removing these roots the same day they are dug if possible. The bulbs should be set in rows 6" apart and 3" or 4" apart in the row. They should be from 3" to 5" deep at the bottom depending upon the size which will vary considerably. An easy way to dig the bulbs without mixing them or losing any is to take one lot at a time, soil and all, and place them on a $\frac{1}{4}$ " mesh screen gently shaking the soil through and leaving the bulbs on the screen.

After they are re-planted they will need no further attention except for water during the growing season. They may be left in the same spot until they have bloomed for two or three years.

CHROMOSOME NUMBERS REPORTED IN RECENT YEARS FOR
HEMEROCALLIDEAE, ALSTROEMERIALES, AND AMARYLLIDALES

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Six years ago a compilation of known chromosome numbers for the plants dealt with by the American Amaryllis Society appeared in Volume 4 of *Herbertia* (8). The present article brings up-to-date the summary of chromosome numbers reported for plants in these same groups.

In the previous review were listed chromosome numbers for about 240 species or botanical varieties from 28 genera, and in addition for some 60 horticultural varieties. The present article lists in table 1 the chromosome numbers for all species and varieties given in available published form since the 1937 review.¹ It includes numbers for about 160 species and botanical varieties, and in addition for some 40 horticultural varieties. Some of these numbers are for the same species listed earlier and in such instances they may be either identical or different from the counts reported in the earlier list. In either case they represent studies of papers not represented in the earlier review—with one exception. Several species and varieties of *Hemerocallis* for which chromosome numbers were reported by Dr. Stout in 1932 (37), and which were inadvertently omitted in the 1937 summary, are now included for completeness.

Table 1 includes chromosome numbers for several different categories not studied before 1937. No published cytological studies had been made on any member of the tribes Gillesieae or Ixioliriae prior to 1943. Chromosome descriptions of one species of each of these tribes have been made (1, 43). This leaves only the tribe Eustephieae, in the Amaryllidaceae, on which no chromosome reports have appeared. Altogether 85 species for which chromosome numbers were unknown in 1937 are included here. These species are scattered among 21 genera. The names of six genera—*Miersia*, *Cooperia*, *Habranthus*, *Griffinia*, *Ixiolirion* and *Sprekelia* are new to the list—although actually one species of *Habranthus*, then given as a *Zephyranthes*, appears in the earlier table. In addition to the species there are some 50 varieties (about 15 botanical, 35 horticultural) whose chromosome numbers are given here but not in the earlier table.

From the standpoint of generic gains in numbers of species studied cytologically during the past six years; we find the already comparatively well-covered *Narcissus* and *Allium* groups at the top of the list. Previously unreported numbers for 14 species, 7 botanical and 23 horticultural varieties of *Narcissus*, and for 14 species and 1 interspecific hybrid of *Allium* are given in table 1. Considering only the botanical species in the various tribes there also have been somewhat more in-

¹ The one exception to this is in the case of Dr. Fernandes' complete chromosome list (4) of *Narcissus* species and varieties, which appeared in the 1942 *Herbertia*. Species whose chromosome numbers had already been credited to Dr. Fernandes in the 1937 summary are not relisted now. Numbers for species not known by the compiler to have been published elsewhere, however, are given here in table 1.

creases in the Allieae than in other tribes, with numbers having been reported in about 26 species and in addition 1 hybrid and 2 or 3 varieties, not studied prior to 1937. In the Zephyrantheae numbers are listed for 17 species and 1 interspecific hybrid which have been reported since 1937.

Hutchinson's arrangement (11) is again followed in listing the plant groups in table 1 except that changes since proposed by various workers have been adopted along the lines indicated in a recent article by Albert Pam [Herbertia, 9:85-98. 1942 (1943)]. However, the genera are arranged alphabetically within the tribe. Also the same general columnar headings and arrangement are used as in table 1 of the earlier review. Tables 1 of this and the preceding report therefore lend themselves to being easily used together. The two tables together are as complete as it was possible for the compilers to make them, but it is probable that certain papers—from foreign countries especially—have not come to attention. Reference may be made to the 1937 review (8) for the terminology used.

It will be noted in table 1 that in some cases authors for species have been given while in other instances this is not done. The authors of the cytological papers referred to have been followed in this matter.

The data compiled in this report gives only the chromosome numbers for the species and varieties studied by various authors. In many cases these workers have also studied the types of chromosomes and described karyotypes and presented idiograms for the complements in different species and varieties. Good examples of this trend are found in the extensive papers by Sato (33) and Fernandes (4). Not only have extensive chromosome numbers and descriptions been published in cytological studies on the Amaryllidaceae. Certain members of the family, most especially some of the *Allium* species, have been the subject of different descriptive and experimental cytological studies. These include studies of spontaneous (28) and of X-ray induced (34) chromosome aberrations in *Allium*; of the effects of acenaphthene and colchicine (17), and of sulfanilamide and other sulfa compounds (42) on *Allium* as well as some other plants; of chromosome breakage and knot formation in *Pancratium* (10); of male gamete formation in an *Amaryllis* (*Hippeastrum*) hybrid (14); of the mechanism of mitosis in pollen tubes of *Zephyranthes* (35); of the effects of colchicine on the spindle mechanism in pollen tubes of *Crinum* and of *Amaryllis* (41), and of cytological structures in *Allium* and *Narcissus* (23). A number of species in the Amaryllidaceae and related groups have comparatively small numbers of rather large chromosomes. It is such species—other things being equal—which best lend themselves to such cytological investigations.

As the list of chromosome numbers becomes longer and more definite it also becomes more apparent that both polyploidy and also aneuploidy are rather common phenomena in these plant groups. Polyploidy is now reported to occur in about 18 genera and aneuploidy seems apparent in 10 or 11 genera. Aneuploidy, secondary polyploidy, and sexually unstable polyploidy, such as triploidy, apparently are more apt

to occur in horticultural hybrids and varieties, as for instance those of the genera *Nerine* and *Narcissus*. It is often possible that the addition of one or more chromosomes or sets of chromosomes will produce plants containing gene combinations which make that particular plant very desirable horticulturally. In seed propagated plants such individuals are apt to be lost because of sterility, but in forms that are vegetatively propagated an irregular chromosome condition does not interfere with the plants increase.

This summary does not have for its purpose a detailed discussion of phylogeny, evolution and general relationships within and between the various groups. However, it may be pointed out here, as has been done in several of the papers referred to (especially references 12 and 33), that 11 is a predominant basic chromosome number in several groups. This basic number has been reported as occurring in no less than fourteen of these genera. It appears to be the predominating basic number in *Hemerocallis*, *Leucojum*, *Nerine*, *Crinum*, *Clivia*, *Pan-cratiun*, *Amaryllis*, *Lyconis*—and perhaps in *Brunsvigia*, *Griffinia*, *Sprekelia*, *Stenbergia* and other genera. If this basic number of eleven is as consistent and definite in some groups as it appears to be, a possibility worth consideration in future studies is that species in a 10- or 12-chromosome series in these (and perhaps other) genera have been derived from 11 chromosome forms. Other prominent basic numbers in several genera are 8 and 9. Also four or five genera have 6 (or 12) for the predominant basic number. In a list of numbers like those reported in *Zephyranthes*, for example, it is easy enough to postulate how somatic numbers like 25, 38, 46, and $47 + 1$ fragment may have been derived from complements with a chromosome number evenly divisible by 6. Detailed study of the various chromosomes in the complements of different species could furnish evidence for or against such postulations.

The importance of both cytological and morphological studies to the correct interpretation of plant relationships has become more apparent during recent years. In the Amaryllidaceae the cytological picture is gradually taking form. In some genera, and also in some wider taxonomic groups, this picture is already becoming definite and concrete. In such groups the cytological evidence indicates the trend of evolutionary relationships, thus either supplying evidence for or against current taxonomic views—and in some cases suggesting promising directions for future systematic investigations. On the other hand a great many genera have not been studied cytologically, and some tribes have either not been touched, or at most have been sampled very sketchily. Thus this family continues to offer many fertile lanes down which cytotaxonomic and cytogenetic problems may be pursued with good probability of profit.

TABLE 1.

Chromosome numbers in the Hemerocallideae, Alstroemeriales and Amaryllidales as reported since the 1937 compilation (8).

Species or Variety	n	2n	Literature reference
LILIALES			
LILIACEAE			
HEMERCALLIDEAE			
<i>Hemerocallis citrina</i>		22 ²	37
<i>H. fulva</i>		22	2
<i>H. fulva</i> clone "Europa"		33	2,37
<i>H. fulva</i> clone "maculata" ¹		33	37
<i>H. Middendorffii</i>		22	37
<i>H. minor</i>		22	37
<i>Hemerocallis</i> hybrid hort. clones:			
<i>aurantica</i> Major ¹		22	37
Aureole ¹		22	37
Chengtu ¹		33	38
Hankow ¹		22	38
Luteola ¹		22	37
Mikado ¹		22	37
Mulleri ¹		22	37
Rosalind ¹		22	38
Sirius ¹		22	37
Vesta ¹		22	37
ALSTROEMERIALES			
ALSTROEMERIACEAE			
<i>Alstroemeria chilensis</i>		16	33
<i>A. pulchella</i>		16	33
<i>Alstroemeria</i> sp. ("accession no. 36.1215") ¹		ca. ³ 32	9
<i>Bomarea⁴ salsilla¹</i>		18	33
AMARYLLIDALES			
AMARYLLIDACEAE			
ALLIEAE			
<i>Allium Ampeloprasum¹</i>		32	22
<i>A. amplexens</i> Torr. (- <i>A. attenuifolium</i> Kell.)	7 ²		22
<i>A. amplexens</i>	7 ²	14 ² ,28 ²	18
<i>A. Babingtonii¹</i> (- <i>A. Scordoprasum</i>)		48	22
<i>A. Bidwelliae</i> S. Wats. ¹		28	24
<i>A. Cepa</i> L.	8	16	24
<i>A. Cepa</i> L. x <i>A. fistulosum</i> L. ¹		16	3,15,20
<i>A. cilicicum</i> Boiss. ¹	8		24
<i>A. cyaneum</i> Reg. ¹		32	24
<i>A. darwasicum</i> Reg. ¹		16	24
<i>A. decipiens</i> Fisch. ¹		16	24
<i>A. Déséglisei</i> Bor. ¹		32	24
<i>A. margaritaceum</i> Sibth. & sm. ¹		16,32	24
<i>A. nigrum</i> L.	8	16 ²	24
<i>A. Ostrowskianum</i> Reg.		16 ²	24
<i>A. Porrum</i>	16	32	19
<i>A. sativum</i> L.	8	16	24
<i>A. scorzoneraefolium</i> (DC) Red. ¹	7		24
<i>A. senescens</i> L.		48 ²	24
<i>A. Sewerzowi</i> Reg. ¹	8		22

* Exponential figures refer to explanations at the end of this table.

Species or Variety	n	2n	Literature reference
ALLIEAE (contd.)			
<i>A. sibiricum</i> ¹		16	22
<i>A. siculum</i> Ucria ¹		16	24
<i>A. Wallichianum</i> Steud. ¹		16	24
<i>Brodiaea elegans</i> ¹ (<i>B. grandiflora</i>) ⁵	16	32	1
<i>B. coronaria</i> (<i>B. grandiflora</i> , Oregon) ⁵	21	42	1
<i>B. minor</i> ¹ (<i>B. Purdyi</i>) ⁵	16	32	1
<i>B. minor</i> var. <i>nana</i> (<i>B. minor</i>) ⁵	62	122	1
<i>B. stellaris</i>	62	12	1
<i>B. californica</i> (Blue) ⁵	62	122	1
<i>B. californica</i> (Lilac Pink) ⁵	62	122	1
<i>Dichelostemma pulchellum</i> (<i>B. capitata</i>) ⁵		182	1
<i>D. sp.</i> (<i>B. capitata</i> var. <i>multiflora</i>) ⁵		18	1
<i>D. congestum</i> (<i>B. pulchella</i>) ⁵		36	1
<i>D. volubil</i> ¹ (<i>B. volubilis</i>) ⁵	92	182	1
<i>D. ida-maia</i> (<i>B. coccinea</i>) ⁵		482	1
<i>Nothoscordum inodorum</i> (<i>N. fragrans</i>)		322	21
<i>N. inodorum</i> (<i>N. fragrans</i>)	9,10	192	16
<i>Triteleia grandiflora</i> ¹ (<i>B. Douglasii</i>) ⁵		32	1
<i>T. peduncularis</i> ¹ (<i>B. Eastwoodii</i>) ⁵		14	1
<i>T. sp.</i> ¹ (<i>B. peduncularis</i>) ⁵		28	1
<i>T. laxa</i> ¹ (<i>B. laxa</i>) ⁵	14	28(30)	1
<i>T. laxa</i> (<i>B. laxa</i> , Blue King) ⁵		42	1
<i>T. laxa</i> (<i>B. candida</i>) ⁵		48	1
<i>T. crocea</i> ¹ (<i>B. crocea</i>) ⁵		16	1
<i>T. ixioides</i> ¹ var. <i>scabra</i> ¹ (<i>B. ixioides</i> var. <i>splendens</i>) ⁵	5(6)	10(11)	1
<i>T. ixioides</i> var. <i>analina</i> ¹ (<i>B. ixioides</i> var. <i>erecta</i>) ⁵		50	1
<i>T. hyacinthina</i> ¹ (<i>B. lactea</i>) ⁵		28	1
<i>T. hyacinthina</i> (<i>B. lactea</i> , Oregon) ⁵		28	1
<i>T. Hendersoni</i> ¹ (<i>B. Hendersoni</i>) ⁵	16	32	1
<i>T. Bridgesii</i> ¹ (<i>B. Bridgesii</i>) ⁵		16	1
GILLIESIEAE			
<i>Miersia chilensis</i> ¹	10,11	20,21	1a
IXILIRIEAE			
<i>Ixiolirion tataricum</i> Herb. ¹		24	43
GALANTHEAE			
<i>Galanthus nivalis</i>		24,25 ² ,6,28 ²	32,33
<i>G. Elwesii</i>		24,48 ²	32,33
<i>Leucojum aestivum</i>		22	31,33
<i>L. autumnale</i>		14	31,33
<i>L. vernal</i>		22 ²	31,33
<i>L. vernal</i> var. <i>carrathicum</i> ¹		22	31,33
BRUNSVIGIEAE			
<i>Brunsvigia rosea</i> (syn. <i>Amaryllis belladonna</i> Ait. et Herb. non Linn.)		22 ²	12,33
<i>B. sp.</i> (<i>Amaryllis alba</i>) ¹		39	33
<i>B. sp.</i> [<i>Amaryllis striatiflora</i> (<i>Zephyranthes</i>)] ¹		12	33
<i>Crinum bulbispermum</i> (<i>C. capense</i>) ¹		22+2ff.	33

Species or Variety	n	2n	Literature reference
BRUNSVIGIEAE (contd.)			
<i>C. asiaticum</i> var. <i>japonicum</i>	11 ²	22	40
<i>C. asiaticum</i> var. <i>japonicum</i>		22	12,33
<i>C. asiaticum</i> L. var. <i>sinicum</i> Bak. ¹		22	12
<i>C. gigas</i> ¹		24	39
<i>C. gigas</i>	11 ²	22 ²	40
<i>C. gigas</i> Nakai		22	12,33
<i>C. latifolium</i>	11 ²	22 ²	40
<i>C. latifolium</i>		22	12,33
<i>C. lineare</i> ¹		22	33
<i>C. lineare</i> var. <i>album</i> ¹		22	33
<i>Crinum macrantherum</i> ¹		33	33
<i>C. maritimum</i>		24 ²	39
<i>C. Moorei</i> ¹		22	33
<i>C. Moorei</i> var. <i>album</i> ¹		22	33
<i>C. Rattrayii</i> ¹		22	33
<i>Nerine Bowdeni</i>		22(-23?)	13
<i>N. curvifolia</i> Herb.		33 ²	12
<i>N. curvifolia</i> ⁷		22	33
<i>N. curvifolia</i> var. <i>Fothergilli major</i> ¹		24	13
<i>N. falcata</i> ¹		22(-23?)	13
<i>N. filifolia</i>		24	13
<i>N. flexuosa</i> ¹		33	33
<i>N. flexuosa</i> var. <i>alba</i> ¹		22	13
<i>N. humilis</i> ¹		33	12,33
<i>N. pudica</i> ¹		33	12,33
<i>N. sarniensis</i>		33 ²	12,33
<i>N. sarniensis</i> var. <i>coruscans major</i> ¹		22	13
<i>N. undulata</i>		22	12,33
<i>Nerine</i> hybrid Hort. clones			
<i>Chameleon</i> ¹		22(?)	13
<i>Manselli</i> ¹		24	13
<i>Elegantissima</i> ¹		28	13
<i>Mrs. George Barr</i> ¹		28	13
<i>Ingens</i> ¹		32(-34?)	13
CYRTANTHEAE			
<i>Crytanthus obliquus</i> ¹		22	33
ZEPHYRANTHEAE			
<i>Cooperia Drummondii</i> Herb. ¹		48	6
<i>C. pedunculata</i> Herb. ¹		48	6
<i>C. Smallii</i> Alex. ¹		54	7A
<i>C. Traubii</i> Hayward ¹		24	6
<i>Habranthus robustus</i> Herb. ¹ (syn. <i>Zephyranthes robusta</i>)		12	5
<i>H. robustus</i> (syn. <i>Zephyranthes robusta</i>)		12	33
<i>H. Andersoni</i> var. <i>texanus</i> (syn. <i>Zephyranthes texana</i>)		24	33
<i>H. Andersoni</i> ¹		21	33
<i>H. Andersoni</i> Herb. ex. Lindl.		24 ²	7C
<i>H. brachyandrus</i> (Baker) Sealy ¹		24	7c
<i>H. brachyandrus</i> (Baker) Sealy x <i>H. robustus</i> Herb. ¹		18	7c

Species or Variety	n	2n	Literature reference
ZEPHYRANTHEAE (contd.)			
<i>Sprekelia formosissima</i> (L.) Herb. ¹		ca. ³ 110	12
<i>S. formosissima</i>		110-117	33
<i>Sternbergia lutea</i>		16 ²	27
<i>S. lutea</i>		22 ²	12,33
<i>Zephyranthes Atamasco</i> (L.) Herb. ¹		24	7B
<i>Z. Ajax</i> ¹		ca. ³ 43;44	7B,7C
<i>Zephyranthes candida</i> Lindl. (Herb.)	19	38	12
<i>Z. candida</i> (Lindl.) Herb.		38	7B,33
<i>Z. grandiflora</i> (syn. <i>Z. carinata</i> Herb.)	24 ²	48 ²	12
<i>Z. grandiflora</i> (syn. <i>Z. carinata</i> Herb.)		48	7C,33
<i>Z. macrosiphon</i> Baker ¹		ca.48;46	7B,7C
<i>Z. longifolia</i> Hemsl. ¹		46	7B
<i>Z. pulchella</i> J. D. Sm. ¹		48	7B
<i>Z. Taubertii</i> ¹		12	33
<i>Z. texana</i> (- <i>Habranthus Andersoni</i> var. <i>texanus</i> , which see above.)			
<i>Z. Treatiae</i> S. Wats. ¹		24	7B
<i>Z. robusta</i> (- <i>Habranthus robustus</i> , which see above.)			
<i>Z. Lindleyana</i>		24 ²	33
<i>Z. Simpsoni</i> Chapman ¹		48	7B
<i>Z. tubispatha</i> Herb. ¹		25	7C
<i>Z. sp.</i> (from lower Rio Grande Valley of Texas) ¹		47+1f.	7B
HAEMANTHEAE			
<i>Clivia crytanthiflora</i> (<i>C. nobilis</i> x <i>C. miniata</i>) ¹		18	44
<i>C. miniata</i> Reg.		22	12
<i>C. nobilis</i> ¹		22	12
<i>Haemanthus albiflos</i> Jacq. ⁸		16	12,33
<i>H. albiflos</i> var. <i>pubescens</i> ¹		16	33
<i>H. coccineus</i> L. ¹		16	12,33
<i>Haemanthus</i> "Prince Albert" ¹		18	12,33
AMARYLLISEAE			
<i>Amaryllis hybridum</i> (<i>Hippeastrum hybridum</i>) ¹		44	12
<i>A. rutila</i> (<i>H. rutilum</i>) ¹		44	33
<i>A. vittata</i> (<i>H. vittatum</i>) (L.) Herb.		44 ²	12,33
<i>A. Blumenavia</i> (<i>Griffinia Blumenavia</i>)		77	33
<i>Lycoris albiflora</i> Koidz.	17/2 ²	17	12
<i>L. aurea</i> Herb.	6 ² ,13/2 ²	12,13 ²	12
<i>L. radiata</i> Herb.	33/2 ²	33	12
<i>L. sanguinea</i> Maxim.	11	22	12
<i>L. squamigera</i> Maxim.	27/2 ²	27	12
<i>L. squamigera</i>		27	33
<i>L. straminea</i> Lindl. ¹		16	12
<i>Lycoris sp.</i> ¹		22	29
NARCISSEAE			
<i>Narcissus asturiensis</i> Pugsley ¹		14	4
<i>N. biflorus</i> Curt. (<i>N. tazetta</i> L. x <i>N. poeticus</i> L.)		17	4

Species or Variety	n	2n	Literature reference
NARCISSEAE (contd.)			
<i>N. Broussonetti</i> Lag. ¹		22	4
<i>N. Bulbocodium</i> L.			
var. "Chiqueda" ¹		26,27	4
var. "Foz do Arelho" ¹		26	4
var. "Leca do Bailio" ¹		21	4
var. "Mira de Aire" ¹		26	4
var. "Parede" ¹		26	4
var. "Pinhal de Leiria" ¹		35	4
var. "Pinhal do Valado" ¹		26	4
var. "Pontal" ¹		26	4
var. "Povoa de Lanhoso" ¹		42	4
var. "Raposeira" ¹		26	4
var. "Redinha" ¹		28	4
var. "S. Martinho do Porto" ¹		26	4
var. "Tapada da Ajunda" ¹		26	4
var. "Vimeiro" ¹		14	4
<i>Narcissus dubius</i> Gouan ¹		50	4
<i>N. elegans</i> Spach.			
var. <i>fallax</i> F. Q. ¹		20	4
ssp. <i>intermedius</i> (Gay) F. Q. ¹		20	4
<i>N. gaditanus</i> Boiss et. Reut.		14	4
<i>N. gracilis</i> Sabine ¹		14	30,36
<i>(N. Jonquilla</i> L. x <i>N. Poeticus</i> L.)			
<i>N. incomparabilis</i>			
var. <i>auratus</i> ¹		14	33
var. "Sir Watkins"		21	36
<i>N. Jonquilla</i>		14	33
<i>N. Jonquilla</i> L. var. <i>Henriquesi</i> Samp. ¹		14	4
<i>N. Jonquilla</i> "Simple odorante" ¹		14	4
<i>N. Jonquilla</i> "Double odorante" ¹		14	4
<i>N. jonquilloides</i> Willk. ¹		21	4
<i>N. juncifolius</i> Lag. ¹		14	4
<i>N. odorus</i> L. (<i>N. Pseudonarcissus</i> L. x. <i>N. Jonquilla</i> L.)		14	30,36
<i>N. pachybolbos</i> Durieu ¹		22	4
<i>N. Panizzianus</i> Parl. ¹		22	4
<i>N. papyraceus</i> Ker. ¹		22	4
<i>N. poeticus</i>		21 ²	33
<i>N. poeticus</i> L.		14	36
<i>N. poeticus</i> L.	7-14	21	26
var. <i>recurvus</i>		21	25
var. "King Alfred" ¹		28	36
<i>Narcissus polyanthos</i> Lois. ¹		22	4
<i>N. Pseudonarcissus</i>		14	33
<i>N. Pseudonarcissus</i> L. var. "Victoria"		22	36
<i>N. serotinus</i> L.		30	4
<i>N. Tazetta</i> L.		21 ²	36
<i>N. Tazetta</i> L.		30 ² ,31 ²	26
var. <i>caniculatus</i> ¹		29	36
var. <i>papyraceous</i> ¹		22	33
var. <i>suisen</i> ¹		32	33
var. "Almaluez" ¹		29	36
var. "Cerca do Convento de Mafra" ¹		22	4
var. "Grand Soleil d'or" ¹		20	36
var. "Jardim da Quinta das Varandas, Coimbra." ¹		30	4
var. "Narcisse a bouquet totus albus" ¹		22	4
var. "Narcisse a bouquet totus albus grandiflorus." ¹		22	4

Species or Variety	n	2n	Literature reference
NARCISSEAE (contd.)			
<i>N. Tazetta</i> L. var. ?		20	4
<i>N. viridiflorus</i> Schousb. ¹		28	4
<i>N. Watieri</i> Maire ¹		14	4
EUCHARIDEAE			
<i>Eucharis grandiflora</i> ¹		68	33
<i>Hymenocallis lacera</i> (-rotata)		69 ²	33
<i>H. littoralis</i> ¹		46	33
<i>Hymenocallis</i> sp. (<i>galvestoniensis</i> ?) ¹		52	7A
<i>Pancratium illyricum</i> ¹		44	33
<i>P. speciosum</i> Salisb.		46 ²	12

1 This species (or variety) was not included in the 1937 review because the first report on its chromosome number has only appeared in recent years (note exception mentioned in the text in case of **Hemerocallis**).

2 This chromosome number has been reported for this species (or variety) in recent years, and consequently did not appear in the 1937 compilation.

3 Abbreviation for circa (about or approximately).

4 Spelled **Bomalia** in reference cited but very apparently meant for **Bomarea**.

5 Name in parenthesis is the one listed in Carl Purdy's catalog (Ukiah, California) from whom the material was obtained.

6 Only one plant was found with this number.

7 Listed as **Nerine curviflora** by Sato (33) but apparently meant to be **N. curvifolia**.

8 Listed as **Haemanthus albiflorus** Jacq. by Inariyama (12), but no listing of a species with this spelling is found in Index Kewensis.

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AMARYLLIS BREEDING REPORT, 1943

HERMON BROWN, *California*

Since the appearance of my short account of breeding activities in 1939 HERBERTIA (pages 203-205), I have imported six bulbs of pure white hybrid amaryllis from Holland which arrived after World War II had started. I also have two lots of seedlings from Holland firms that have come into bloom. Mr. Pierre S. du Pont has also kindly sent me some of his choice clones and seedlings. All of this material has been added to my own good stock and this gives me some very fine parents for my breeding operations.

I am not attempting to keep any of my original strain separate but am using the best from all sources for crossing. Seedlings from such crosses are now coming into flower, and it is a great pleasure to observe the new ones for the first time.

I was still somewhat hazy about the ideal in view in my breeding work since I had never shown my hybrids to other amaryllis breeders. However, in April of this year, I had the good fortune to have Dr. Traub come to see my collection on a Sunday. He saw them at their best and liked many of them and seemed very much pleased over the progress I have made. Some of my "choice" ones he characterized as gaudy and common, but in the majority of cases we did agree, and I feel that I am now on the right track. Dr. Traub was especially pleased with my pastel colored blooms. I had a dark red of my original strain that he considered as good as the best.

I have room in my greenhouse for only a few hundred bulbs in pots for breeding purposes. Dr. Traub looked them over and rated my best ones. About 30 were rated 90% or better, and about an equal number 85 to 90%. To these I have added about 40 excellent bulbs so that I have about 100 now that rate 85% to 99%. I plan to bring in about 50 each year from the large field of seedlings and will then discard others that fall behind in the competition. In this way my breeding stock should be constantly improved.

Due to the shortage of orchard workers, I have been very busy in my prune orchard and I can do only a small part of what I would like to do with my amaryllis. But I am getting pleasure and some profit from my flowers. Many garden enthusiasts come to see my flowers and that is as it should be for this old world needs some beauty and enthusiasm to assist in keeping up morale in these trying times.

NOTES ON INHERITANCE IN BRUNSVIGIA

E. O. ORPET, *California*

In 1936 the writer imported white-flowering hybrid *Brunsvigia*¹ clones including the clone *Multiflora Alba*, from Australia. A brief report was made on these in 1937 HERBERTIA. In 1938, a large number of seeds was obtained by hand pollination from an isolated planting of *Multiflora Alba*. No notes were made on color of seeds.

¹ See articles by Hannibal, *Herbertia* 9:100-101; 101-102, 146. 1942 (1943).

TABLE I

Brunsvigia hybrid, Multiflora Alba, analysis of number of seeds per capsule, proportion in the seedcoat color and seed size classes; season 1943, Santa Barbara, California (E. O. Orpet).

Capsule No.	Colorless				Tinted pink				Splashed red				Total No.
	large	medium	small	total	large	medium	small	total	large	medium	small	total	
1	2	2	0	4	1	2	0	3	1	0	0	1	8
2	2	0	0	2	0	2	0	2	3	1	0	4	8
3	2	1	1	4	1	0	1	2	2	2	0	4	10
4	0	0	1	1	5	3	1	9	4	1	1	6	16
5	0	0	0	0	3	1	0	4	4	1	0	5	9
6	1	5	2	8	1	1	0	2	2	2	0	4	14
Total No.	7	8	4	19	11	9	2	22	16	7	1	24	65
Average No.	1.1	1.3	0.6	3.1	1.8	1.5	0.3	3.6	2.6	1.1	0.1	4	10.8
Ratio	3				4				4				

These seeds were planted, and in 1942 a few of the seedlings flowered—all were pink-flowered. In 1943, many more flowered and a large proportion, approximately 30 per cent, were pure white and true to the *Multiflora* flowering habit.

Seeds of the clone *Hathor*, a distinct, white clone, were also planted in 1938. All of these seedlings were white-flowering with no pink segregates.

Seeds of the clone, *Multiflora Alba* were again harvested in 1943. After placing the seeds under glass to harden, it was noticed that the seedcoats were either colorless, or tinted pink, or splashed red. An analysis was made of the seeds in six seed capsules. The data is presented in Table 1.

It should be mentioned that as to distribution in the capsule, seeds of the three color classes were in most cases intermixed. Some red ones, for instance, were found at the base of the capsule, and colorless ones at the top exposed to full sunlight.

All of the colorless seeds and some of each class of the colored ones were planted in order to study further the inheritance of the color character in *Brunsvigia*. It would be of interest to know if the white flowering habit is associated with colorless seeds. Any results secured will be reported in future issues of HERBERTIA.

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BRUNSVIGIA ROSEA BREEDING

E. P. ZIMMERMAN, *California*

The breeding and growing of amaryllids is one of the writer's specialties. In the nurseries and fields, there are over 150,000 bulbs in all sizes from the seedling stage to flowering size of the Cape Belladonna, *Brunsvigia rosea* (syn. *Amaryllis belladonna* Ait. et Herb., non Linn.), and hybrids. The breeding work on this subject has now gone through four generations from seeds.

The original stock of *Brunsvigia rosea* was secured from Truffaut, Versailles, France, and included the type *B. rosea*, and the varieties *spectabilis*, *bicolor*, and *purpurea*. Additional stock, consisting of bulbs collected in their native habitat in Cape Province, South Africa, were secured from a collector.

This splendid species, *B. rosea*, is quite variable in size, shape and color of flower. The color ranges from almost white to various shades of red and purple. From a block of 20,000 flowering bulbs in the open field, 36 outstanding clones have been selected as worthy of naming. Some are broad-petaled and others narrow-petaled. These latter have an attractive informal appearance. It is a most beautiful sight when this block of bulbs is in bloom.

The writer experienced a surprise during the present year—something that had not been seen by him before during his 32 years in growing *B. rosea*. Four bulbs bloomed in a 6,000 batch of 4 year old seedlings still in the seed flats. It may be that these can be used as the basis of an early flowering strain of *Brunsvigia rosea*. Such an advent would make this worthy subject even more popular.

MUTATIONS IN AMARYLLIDS

L. S. HANNIBAL, *California*

Last year Dr. Traub mentioned umbellate mutations (HERBERTIA 9:53, 1942.) pointing out the importance of the subject. This brief report concerns some that have come under the writer's observation.

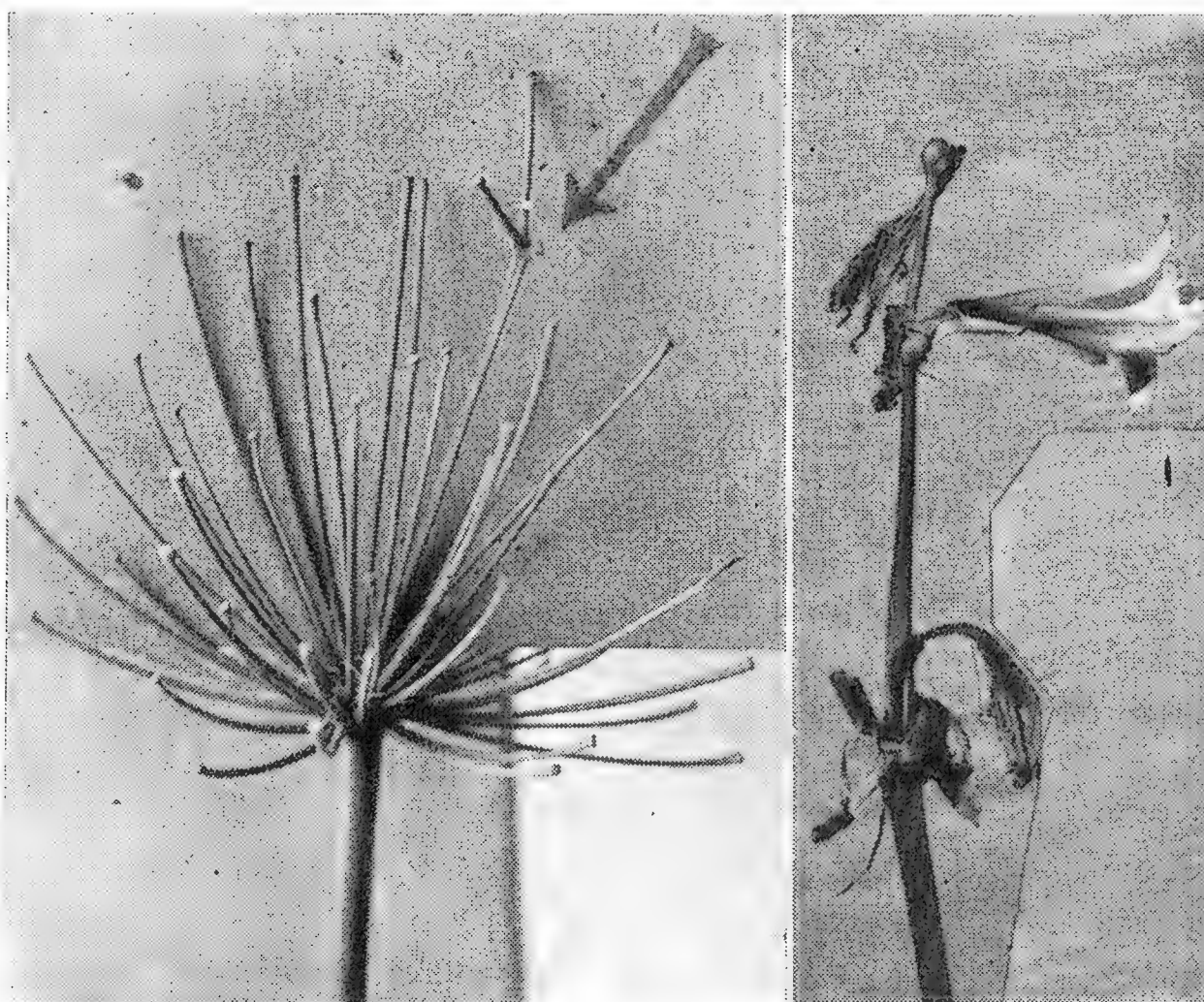


Fig. 102. Branched pedicels, left, *Agapanthus orientalis*; right, *Brunsvigia rosea*.

Agapanthus orientalis, a common garden plant in California, which is usually called *A. umbellatus* (an exact replica of plate No. 6 in Redoute's *Les Liliacees*) seems to show the most primitive of mutations. Secondary branching of pedicels is quite common, (See arrow in Fig. 102.). A number of these have been examined and have always been found to be three branched, with the secondary pedicels usually of the following lengths, or ratios of these lengths, respectively: 4 mm., 15 mm., and 25 mm. Floral mutations have also been noticed. It is not unusual to find a blossom with 8 perianth segments and occasionally 10. One plant was found with 16% of the blossoms having 8 segments but as *Agapanthus* grow easily from seeds this may be an exception for this individual only.

A mutation with a branched scape in *Agapanthus* is less commonly found. The writer has observed it only 3 or 4 times. In some cases the branching seems to come up from within the sheathing about the scape as two scapes may appear together from the same leaf axil.

The only other case of branched scapes noticed in a genus other than *Agapanthus* was in *Ismene calathina*. About one inch below the spathe-valve, which contained 3 blossoms, a $\frac{1}{4}$ inch stem appeared which carried a single small aborted blossom complete with spathe-valve and all floral parts in miniature. The overall length was less than $\frac{1}{2}$ inch.

Figure 102 shows a mutation in *Brunsvigia rosea* (syn. *Amaryllis belladonna* Ait. et Herb. non Linn.). The secondary umbel contained three pedicels with normal blossoms. (An apology is due for presenting such a sad looking specimen but for the sake of science the scape was rescued from an ash heap.) Also noticed is an occasional tendency for the pedicels of the variety *major* of our local form of *Brunsvigia Rosea*, to fuse together giving a "double flower." This seems to occur more often in some years than in others.

In 1937 the writer became quite interested in colchicine which had been reported as an agent capable of doubling the chromosome. The work was followed closely and note was taken of the reported success with *Lilium*. Before long some of this poisonous alkaloid was purchased locally and tried on *Amaryllis* seeds and seedlings. The results were far from satisfactory—disastrous in fact. A solution of sufficient strength to act usually meant death to the seedling plant. If the seed did grow, waiting 4 or 5 years for a mature bulb seemed too slow to observe results. The treatment of the sub-terminal buds of mature bulbs was suggested and preliminary tests indicated that the idea was apparently sound. A number of amaryllids were selected—the portion of the bulb above the plate was cut away until the subterminal area was exposed. The region was then wetted with several drops of 0.75% colchicine solution and after it was absorbed into the bulb the latter was set away to await results. In most cases well established bulbs in pots were used. The root systems were not disturbed since each plant would need all the energy it could get to reestablish itself. Offsets attached to mature bulbs offered the most favorable possibilities and much of the material seemed to respond with the formation of a badly warped and swollen bulblet in the subterminal area. The exactness of exposing the growing point immediately above the basal plate was the most critical factor, but the results seemed so promising that subsequently several hundred *Narcissus* bulbs were treated in the early spring of 1940 just before the development of the foliage parts in miniature for the following year. Details of the method were reported in 1941 (Jour. of Calif. Hort. Soc., Pp. 117-120, 1941) and in the year following extensive work was carried out on a number of sterile *Narcissus hybrids* of *Triandrus*, *Jonquil*, and *Tazetta*.

Fortunately a portion of this latter material was planted quite deeply in a raised bed of sandy soil where excellent drainage was possible. The remainder of the bulbs were stored in moist peat moss until fall. Mosaic disease had not appeared in previous tests, but the weakened *Triandrus* bulbs that had been stored in the peat-moss developed

a bad case which showed up the following spring. Those in the well drained bed did better—that is, as good as could be expected for bulbs that had been so badly cut up and exposed to the drastic effects of colchicine—for the foliage which appeared was badly warped and twisted from the irregular cellular mutation and divisions. Naturally no blossoms appeared, but that had been experienced before. In fact, no flowers appeared on the bulbs treated the previous year, but what seemed odd was that with the bulbs treated two years before, both *Amaryllis* and *Narcissus*, no indication of larger cell structure or double chromosome behavior could be detected. This last spring (1943) the *triandrus* also failed to show any abnormal condition. The writer did not have the facilities to make sections for microscopic study, but he is quite convinced that the effects of colchicine are readily thrown off in the second year of foliage development. Dr. Traub mentioned similar experiences with daylilies. Temporary mutations are very common in *Narcissus*. If they were more permanent we would have all kinds of queer things. Very few mutations from colchicine treatment are ever more than temporary. Our results are by no means final, for we are still trying to get seeds or viable pollen from these sterile hybrids, but it does not look too encouraging at present.

NOTES ON DAYLILY BREEDING

J. MARION SHULL, *Maryland*

This fragmentary report on *Hemerocallis* breeding is presented only for what it may be worth. It is not a completed work. The chief interest being horticultural rather than genetic the work has not been carried on under the rigid discipline demanded for research in genetics, nevertheless it seems worth recording as a sidelight on the complexities of genetic behavior.

Possession of a green-house-forced plant of the clone *H. fulva rosea*, *Rosalind*, in early spring of 1941, made possible the use of *Rosalind* pollen on the three *Hemerocallis* species then blooming in the garden. These were *H. Middendorffii*, *H. minor*, and *H. flava major*. *Rosalind*, like most close relatives of *H. fulva*, is tall and freely branched, but is roseate in body color as well as red eyed, and is quite late with its bloom.

Hemerocallis Middendorffii on the other hand is dwarf, unbranched, a clear orange yellow self, and blooms early. Thus there are four distinct and completely opposing characteristics: dwarf—tall; unbranched—branched; yellow self—red with eye pattern; and early—late.

The family was not large, only 35 plants, of which all but 3 bloomed in 1943. Twelve were definitely early, blooming along with the mother, *H. Middendorffii*, and while none of these was identical with *H. Middendorffii*, there were only slight differences of color and form, and several that had some stems with one or more short branches. In fact the resemblances to the mother were so close as to suggest that pollen other than that of *Rosalind* may have found access to the stigmas during the period of receptivity. Beginning bloom of these early members was from May 12 to 17 for the year 1943 here at Chevy Chase, Md.

In the remaining 20 there would appear to be a broad general dominance of the male parent with slight variation. One began blooming as early as May 31, and one as late as June 23, but mostly they fell between June 4 and 19. Thus they are definitely midseason rather than early or late like the parents.

Inasmuch as these all show decided resemblance to the male parent there can be no question of their legitimacy. All are decidedly branched, like the father, none capitate. As to color, while all show the eye pattern of the pollen parent, *Rosalind*, sometimes sharply defined, sometimes blurred, but always markedly present, not one shows any suggestion of the roseate body color of *Rosalind*. The body color is a clean bright orange, a little brighter than in *Europa* at its best, and never tawny. In general, however, they remind one of *Europa*, and the blooming time is coincident or nearly so with that clone. As they are nearing the end of their bloom, the first scapes of *Rosalind* are still just emerging from the leaf fans.

Sufficient reliable data is not at hand for a report on *H. flava major* by *Rosalind*, but in the family resulting from *H. minor* by *Rosalind* the story is similar in some respects to that of *H. Middendorffii*, but quite different in others. Of 23 plants I shall rule out as probably illegitimate the two which bloomed early and nearly identical with *H. minor* in all characters. The remaining 21 all display the eye pattern derived from *Rosalind*, but unlike the preceding family, body color is quite variable, from pallid yellow flesh tones to fairly dark tawny or even blackish reds. Never is the bright orange yellow of the preceding family attained. In general the quality of the color is not as good as one would like, and in all cases they are considerably affected by the sun, whereas in the other family the colors appear to be sun-fast.

I have no reason to offer as to why the combining of *Hemerocallis minor* with *Rosalind* should give a progeny so different from that of the closely similar combining of *H. Middendorffii* and *Rosalind*. It only goes to show what an intricately variable thing heredity is, and that one dare not generalize from one species to another.

As a final and seemingly unrelated observation, most of the offspring of *H. Middendorffii* by *Rosalind* carry a long banner-like bract subtending the lowest branch of the inflorescence, in some cases attaining a length of more than a foot. This seems totally unaccounted for in the immediate ancestry, for both *H. Middendorffii* and *Rosalind* are quite short bracted, nor do long bracts appear to be present in *Europa*. I do find long bracts in such clones as *Sir Michael Foster*, *Calypso* and *Hyperion*, though not equal to those reported above, and there is considerable variability within the same clump of any of these.

DICHOGAMY AND INTERSPECIFIC STERILITY

HAMILTON P. TRAUB, *California*

During the present year attempts were made to hybridize *Alstroemeria* species under the conditions of the lower Salinas Valley. As a preliminary, a study was made of the time of stamen maturity and pistil receptivity in this Genus.

Dichogamy. In the species studied—*Alstroemeria pulchra*, *A. haemantha* and *A. psittacina*—dichogamy was quite pronounced. Dichogamy refers to the condition, brought about by the maturity at different times of the anthers and stigmas, that promotes inter crossing between hermaphrodite flowers. Dichogamy in *A. haemantha* is diagrammatically illustrated in Figure 103. It should be noted that the stamens mature first

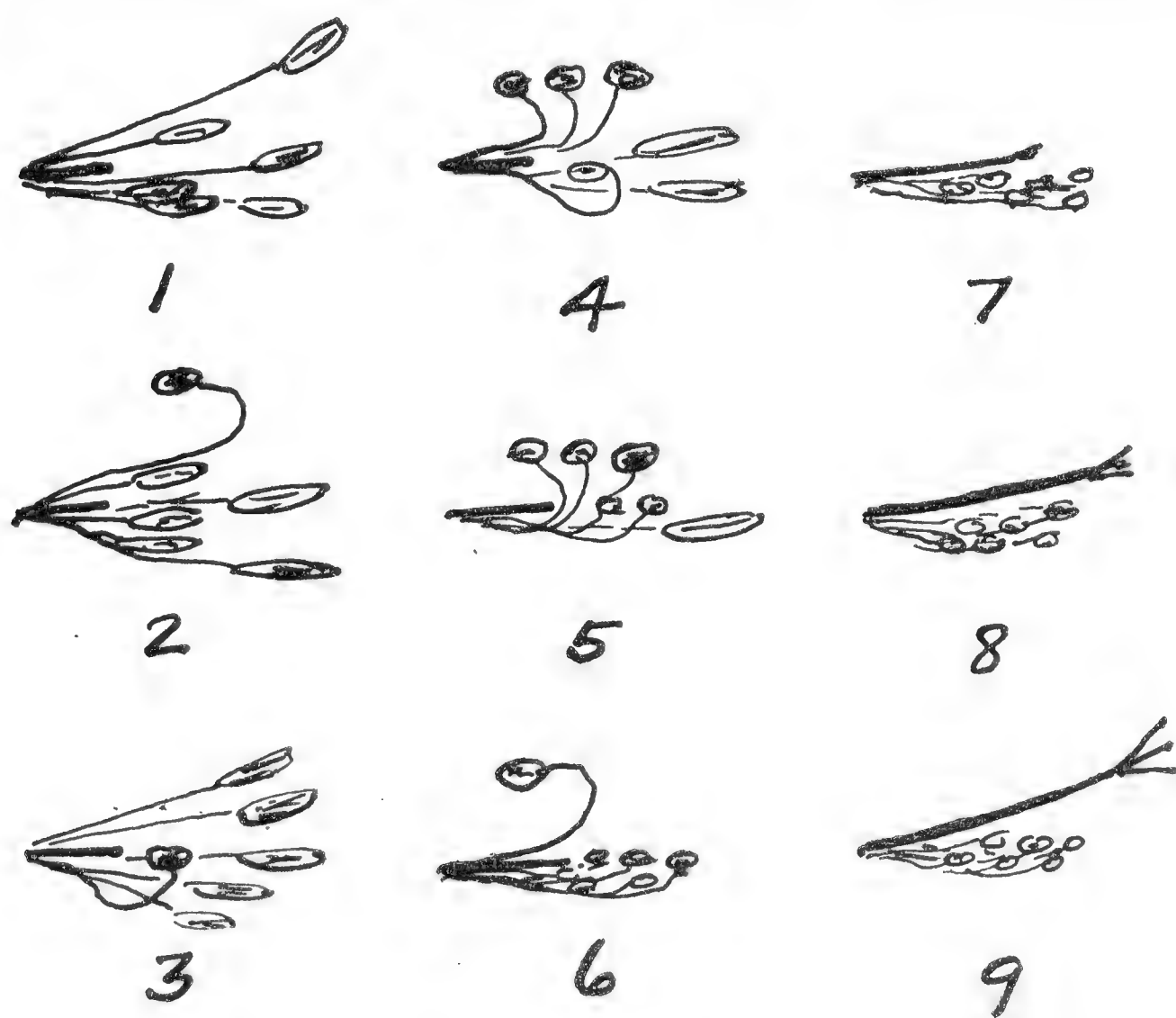


Fig. 103. Dichogamy in *Alstroemeria haemantha*; development of stamens and pistil: (1) July 1; (2) July 2, first stamen shedding pollen; (3) July 3, stamen withering after shedding pollen; (4) July 4; (5) July 5; (6) July 6; (7) July 7, all stamens withered, pistil elongation begins; (8) July 8; (9) July 9, stigma is receptive.

and the last ones have all shed their pollen and have withered by the time the stigma becomes receptive. There is at least a three days' interval between the time the last stamen sheds pollen and the time the stigma becomes receptive. This condition leads to extensive interchange of genes between the individuals of this species and would also lead to hybridization with compatible species if their ranges would overlap.

These observations were made under the conditions of the lower Salinas Valley where the climate simulates that of a cool greenhouse for most of the year. Daylilies, for instance, last from two to three days,

which means that growth and senescence are slowed down considerably as compared to warmer climates. In the latter case the time table for stamen and pistil development as outlined for *A. haemantha* would differ as to time intervals but otherwise the development would be similar.

Attempted crosses. The following crosses were attempted:

A. pulchra (seed parent) X *A. haemantha* (pollen parent)

A. psittacina (seed parent) X *A. haemantha* (pollen parent)

The first cross, *A. pulchra* X *A. haemantha*, proved successful in so far as seed production was concerned. Only six seeds were secured and these have been planted and it remains to be seen what will come from them.

The attempt to cross *A. psittacina* and *A. haemantha* did not prove successful. In all cases the pericarp enlarged to normal size following the application of *A. haemantha* pollen to the stigmas of *A. psittacina*, but when the apparently normal capsule had ripened and was broken open there were only aborted ovules to be seen. These ovules had aborted at an early stage after development began. In every case of fifteen trials, under strictly controlled conditions, this same result was secured. Apparently the tropical Brazilian species, *A. psittacina*, has been isolated for such a long time from the temperate zone species, *A. haemantha*, that physiological isolating mechanisms have been developed in the course of evolution so that gene exchange between them is no longer possible.

It is unfortunate that *A. psittacina* and *A. haemantha* do not cross for the former species has the desirable character of blooming from early summer to mid-winter here in the lower Salinas Valley. *A. pulchra* and *A. haemantha* die down soon after flowering. The flower of *A. psittacina* is not outstanding for beauty, but the shade of red and type of flower are worth considering by the plant breeder as pointed out by Harry L. Stinson in 1942 *HERBERTIA* (p. 125).

Bagging technique. In making *Alstroemeria* crosses, it is necessary to remove the anthers before the flowers open if the entire inflorescence is bagged but in any case, the flower must be covered, and must be kept covered after the cross has been made until the pistil has abscised. Crosses made without this precaution have a doubtful status. Humming birds, especially, may transfer pollen from other flowers.

AGAPANTHUS CLONE, ARTHINGTON WORSLEY

HAMILTON P. TRAUB, *California*

In 1935, the writer imported a number of amaryllids and alstroemerias from van Tubergen in Holland, including a collection of *Agapanthus* species, and the *Agapanthus* clone, *Arthington Worsley*. The species were planted in the border in Florida and all died within two years. This was apparently due to the acid condition of the soil. The clone, *Arthington Worsley*, was planted in a tub and survived. This note is in the nature of a brief history of this plant up to the present. The illustration, Figure 104, is reproduced from a photograph furnished by Perry Coppens who also imported this clone.

The clone was introduced by the late Arthington Worsley. In one of his illuminating letters he pointed out that this clone needs "scads of water during the flowering season." This hint was followed with the result that a scape appeared on the plant in 1936. Unfortunately, during the writer's absence, the tender scape was snapped off, apparently



Fig. 104. Agapanthus clone—Arthington Worsley. Photo by Perry Coppens.

by a bird that attempted to use it as a perch. On the writer's return he surveyed the damage carefully and he decided on the unusual procedure of performing grafting operations on a monocotyledonous plant. The severed portion of the scape was wedge-grafted back on the portion still on the plant. Surprisingly a union was secured but the development

of the scape was slowed down and the flowers never opened normally. No scapes were produced in Florida from 1937 to 1940.

In 1940 the plant was taken to Beltsville, Maryland, and in the early spring of 1942 another scape was produced. The flowers were a beautiful light blue. It is of interest to note that one of the pedicels was branched. One capsule developed but it contained no fertile seeds. In the summer of 1942, the plant was taken to Salinas, California, and planted in the border at 115 Carmel Avenue. In the early summer of 1943 the third scape was produced, and seeds were set.

The balance of this brief note is devoted to an analysis of the inflorescence, the fruits (capsules) and the seeds.

The Inflorescence. The umbel was borne on a tall, solid peduncle. The flowers numbered 144, and 38 or 26.3 per cent of these developed into ripe fruits (capsules). The pedicels were in groups, of varying lengths and some of them crossed one another in different directions (crisscrossed). The flowers are sub-erect but the developing fruit turns downward.

Pedicel lengths. The pedicel lengths are analyzed in Table 1. This shows that there is considerable variation in pedical length with the majority ranging from 4.1 cm. to 8.0 cm.

TABLE 1

Agapanthus clone, **Arthington Worsley**; distribution, into length classes, of 106 pedicels taken at random from the total of 144.

Number in each class	Length classes, cm.					
	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-7.0	7.1-8.0 8.1-9.0
	2	4	22	16	26	22 14

The variation in pedicel length will give us a clue as to the origin of the inflorescence. This will be discussed below.

Pedicel aggregation groups. The variation in pedicel lengths and their crisscrossing led to closer examination of the umbel, and this revealed that the pedicel aggregation groups are apparently abbreviated bostryxes. These groups are analyzed in Table 2.

TABLE 2

Agapanthus clone, **Arthington Worsley**; analysis of 10 pedicel aggregation groups of the umbel taken at random.

Number of groups in each class	Class; number of pedicels in aggregation groups		
	5	6	7
	3	2	5

Preliminary observation on many amaryllids seems to indicate that the umbel in this Family had its origin in the bostryx. Dr. Stout (Bul. Torrey Bot. Club, 68:305-316, 1941) has shown that the typical inflorescence in *Hemerocallis* is the bostryx. We have thus a gradual series from *Hemerocallis* which shows the typical bostryx in such species as *H. multiflora*, and the pseudo-umbel in *H. nana*; the near-umbel in *Ixiolirion*, *Kolpakowskia* and *Triteleiopsis* in which the pedicels are branched (somewhat abbreviated bostryxes), the umbel in *Agapanthus* made up of very much abbreviated bostryxes, and finally the typical amaryllid umbel in such genera as *Allium*, *Brunsvigia*, *Haemanthus*. Further evolution is then in the direction of reduction of flowers in the

umbel which reaches its highest development in species of such genera as *Zephyranthes*, *Habranthus* and *Cooperia* that are characterized as a rule by the umbel with a single flower.

Sterility. Of the 144 flowers in the umbel of the *Agapanthus* clone under consideration, 38, or 26.3 per cent developed into mature fruits (capsules). It is important to note that a high degree of sterility was encountered within these capsules. The information is summarized in Table 3.

TABLE 3

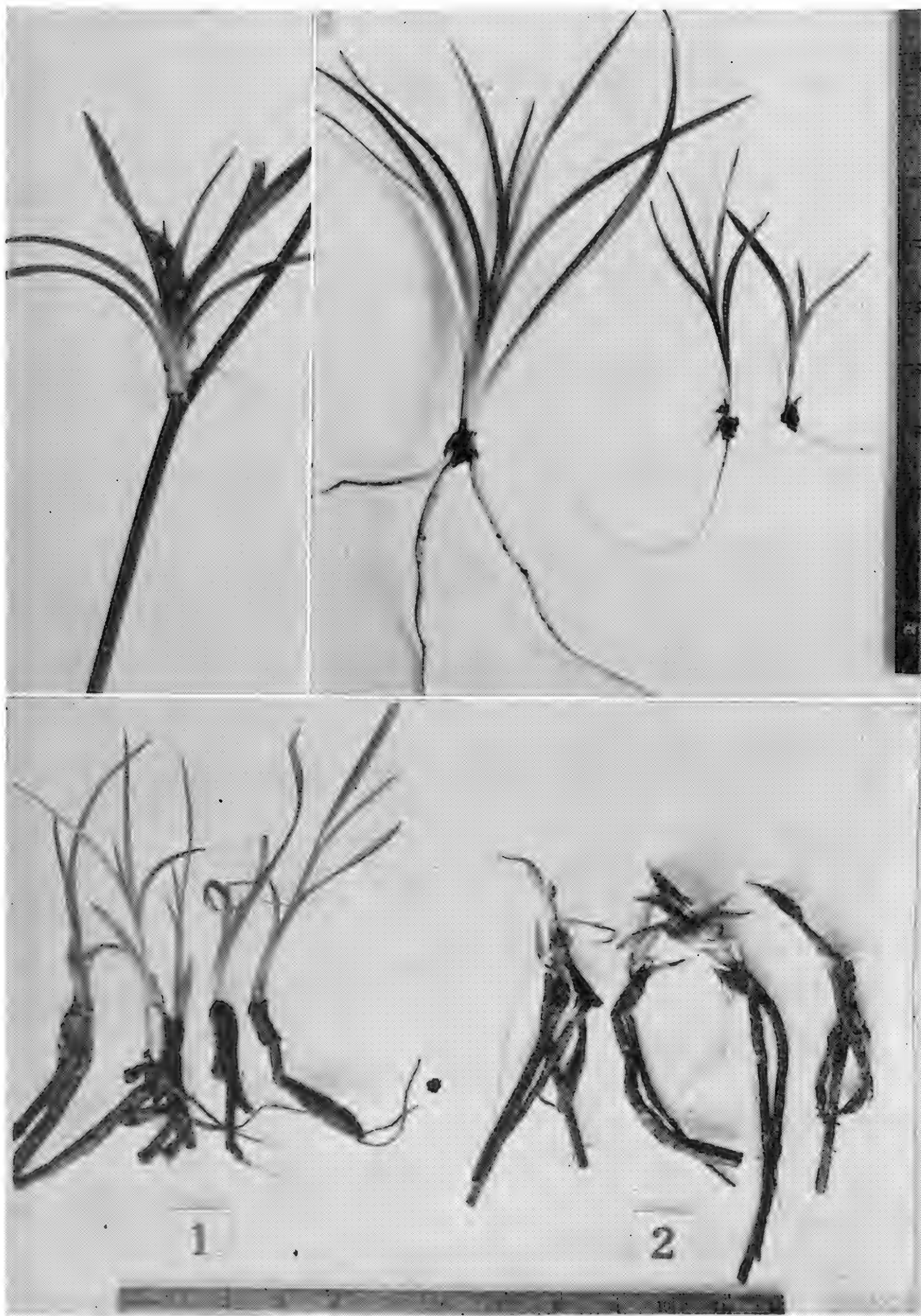
Agapanthus clone, **Arthington Worsley**; analysis of fertile and infertile seeds in 10 capsules taken at random from the total of 38.

	Capsule Nos.										
	1	2	3	4	5	6	7	8	9	10	Mean
Number of fertile seeds	13	10	13	11	8	13	13	10	12	17	12.0
Number of sterile seeds	15	25	18	14	20	16	18	15	17	13	17.1
Total number of seeds	28	35	31	25	28	29	31	25	29	30	29.1
Per cent fertile seeds	46.4	28.5	41.9	44.0	28.5	55.8	41.9	40.0	41.3	56.6	41.2

This Table shows that approximately 41 per cent of the ovules that began development actually reached maturity. The seedcoats of the fertile seeds were black, 8 mm. long and 3 mm. by 4mm. wide. The embryo portion measured 3 mm. by 4 mm. and the wing 5 mm. by 3 mm. In contrast the testa of the sterile seeds were light brown or colorless, 5 mm. long and 1 mm. wide. The embryo portion measured 1 mm. by 2, and the wing, 4 mm. by 1 mm.

There were no *Agapanthus* plants in the immediate neighborhood of 115 Carmel Avenue and most likely the flowers (F-1 generation) were self-pollinated. However, there is still the possibility that foreign pollen was brought in by humming birds. These are an integral part of the garden. There is one individual especially that sits nearby and sings his trial notes when the writer works in the garden.

The fertile seeds have been planted and a detailed report on the second generation (F-2) will be made after the seedlings flower.



Upper left, scape proliferations, **Lidice Daylily**, forming roots at base; upper right, **Hemerocallis** scape proliferations rooted in peat and sand medium. Lower, **Hemerocallis** crown cuttage, $\frac{1}{8}$ divisions rooted after period of incubation in sand rooting medium, (1) evergreen clone, (2) deciduous clone. Photos from U. S. Department of Agriculture.
Plate 249

4. PHYSIOLOGY OF REPRODUCTION

SOME PROBLEMS IN THE PROPAGATION OF THE AMARYLLIDS

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In any field of horticultural activity an occasional pause for an inventory of recent progress is justified. Such a review serves several functions; not only are the most notable recent advances recounted, but gaps in the body of knowledge are called to the attention of those who may be able to study such problems. Furthermore, advances in related sciences which have not yet been applied are brought to the attention of those interested in the narrower field. Though some worthy contributions in propagation practices have been made through studies on the amaryllids and their relatives during the past few years, because of the minor economic importance of many members of this group, there are many questions on which no authoritative statements can be made at present. During the past few decades, many species belonging to the *Amaryllidaceae* have been grown at the U. S. Plant Introduction Garden, Glenn Dale, Maryland, and some observations on these are included in this review.

POLLEN STORAGE AND GERMINATION

Breeders' efforts to make crosses between forms which bloom at different periods have been facilitated by studies on storage of pollen. Although the requirements for satisfactory storage apparently vary from plant to plant, in general the best results are obtained with temperatures reduced somewhat and with humidities stabilized at intermediate or somewhat low level. This has usually been accomplished by using desiccators in which various saturated solutions of salts or appropriate concentrations of sulfuric acid are kept. Details of preparation of solutions to produce different humidities can be found in tables in the chemical handbooks. The saturated solutions of salts are generally preferred to sulfuric acid because of the greater convenience and safety. Another means which has been used occasionally to prolong viability of stored pollen is through reduction of atmospheric pressure. This, however, is beyond the means of most amateur horticulturists. An ordinary household refrigerator furnishes a temperature suitable for the storage of pollen. A desiccator may be provided by a tightly closed Mason or similar jar, placing a supply of the salt or sulfuric acid solution in the bottom to maintain the desired humidity. Traub (31) used a saturated aqueous solution of calcium chloride in a desiccator of this type which provided a relative humidity of 38 per cent at 50°F. He advocates storage of the various pollens in gelatin medicine capsules which are easily obtained at any drug store, using sizes suitable to the quantities of pollen to be handled. A small label for the identification

of the pollen may be placed within the capsule, or identification marks may be placed in ink on the exterior.

Pfeiffer (21) (22) used a temperature of 50°F. for storage of pollen of hybrid amaryllis and found it to be 32 to 67 per cent viable after four months. She considered a relative humidity of 50 per cent superior to lower or higher humidities.

Some recent studies on pollen storage indicate that pollen may be kept for the longest time when held at temperatures near, or even below, freezing. Unquestionably, more exact studies on the storage conditions best for pollen of the various types of amaryllids are needed, together with more information on the periods of viability which may be expected. Some convenient and reliable methods of packing pollen for shipment by mail would likewise be desirable, although wrapping the dried pollen in tinfoil or waxed paper will be satisfactory for relatively short distances.

Frequently the pollen is carried away so rapidly by insects that it should be obtained from opening buds and dried for a short time. Often the stigmatic surfaces of amaryllids are not receptive until some time after the opening of the flower.

The germination of pollen and the growth of the pollen tubes has been promoted by trace elements (36) (38) such as boron, and by certain vitamins (5) and synthetic growth substances of the auxin type (23). Few studies of this type have been conducted with amaryllids up to the present. Addicott (1) tested the action of many chemicals on pollen of *Milla biflora* Cav. A number of compounds either increased the percentage of germination or the elongation of the tubes or both. However, no synthetic medium was as active in promoting growth of the pollen tubes as the exudate from the stigmatic surfaces. This probably indicates the presence of one or more growth factors as yet unidentified.

The noted Russian plant breeder Michurin always insisted that the use of mixed pollens, including some of different unrelated genera, made possible crosses which were difficult or impossible otherwise. In view of the recent discoveries of the effects of growth substances in overcoming self-sterility (8), this subject would appear to warrant careful investigation. Though careful breeders condemn the making of crosses without the record of both seed and pollen parents, unquestionably some breeders of amaryllids have demonstrated that the use of mixed pollens can produce some very outstanding results.

The experiments of Eyster (8) on a self-sterile strain of *Petunia Golden Rose* are a remarkable example of the value of a plant growth substance in overcoming self-sterility. In this strain, the pollen germinates normally, but grows slowly and rarely penetrates more than a tenth of the distance down the style. An abscission layer forms before fertilization can possibly take place. However, pollen of this variety is functional on some other types of petunia. Apparently some substance secreted by the placenta of the ovary is responsible for the slow growth. This is confirmed by the fact that if sap is expressed from the ovaries of the self-sterile strain of petunia and placed on the stigmas and styles of other strains, seed setting is inhibited. Setting of seed could be induced on the self sterile plants by spraying immediately be-

fore or after pollination with a 10 parts per million aqueous solution of alpha naphthyl acetamide. The same treatment was also effective on self-sterile forms of African marigold, red clover and cabbage. Apparently the growth substance is able to compensate for the effect of the inhibitory secretions. However, the delay in the formation of the abscission layer may be an important factor in these results.

SEEDS OF AMARYLLIDS

The amaryllids are a group in which the seeds are frequently short-lived and therefore should be sown as soon after ripening as possible. This is true even for sorts such as *Narcissus* in which a period of dormancy intervenes between sowing and germination. The short span of viability of many sorts often makes them unreliable when obtained from commercial sources.

Vivipary or a condition approaching it is fairly common among the amaryllids. The seeds of *Crinum asiaticum* L. germinate when harvested without the addition of any water since the seed carries sufficient to make germination possible (19). *Hymenocallis speciosa* Salisb. has a seed in which the embryo is commonly immature when the seeds are shed (6). An interesting example of a condition which is intermediate between vivipary and dormancy is the spider lily, *Hymenocallis occidentalis* (Le Conte) Kunth. The embryo of the seed after fertilization undergoes a continuous development toward the formation of an independent seedling even without the presence of light and additional moisture. Apparently this is made possible by foods elaborated by the chlorenchymatous integument of the seed (37). However, the photosynthetic activity in such seeds may play a part in germination (9), and when those of this type are planted, they are best left above the surface of the soil. Seeds of *Haemanthus* often germinate while attached to the parent plant. Commonly when such seeds are shipped long distances they are received in a germinated condition. They should be packed in a medium such as sphagnum moss in such a manner as to allow the root to grow at right angles to the seed. Crowding makes the root curl around the seed which requires that the seed be planted beneath the surface.

Occasionally seed formation is hindered by the competition of the bulb for food materials following the period of flowering when the storage organs become depleted of food reserves. One treatment to induce setting of seed in such cases has been to cut off the flower scapes and keep the base in a nutrient solution containing sugar (17). A treatment also reputed to induce setting of seed of the *Madonna Lily*, which sets seed poorly in northern Europe, is to dig the soil when the buds show and remove the scales from the stem so that the plant becomes practically an annual. However, these reports are difficult to evaluate since the compatibilities of the material used were not investigated.

The culturing of embryos under sterile conditions has become a routine technique in the breeding of certain types of stone fruits and has recently been applied with success to orchids. There are crosses of amaryllids in which this technique might be very useful, but to the best knowledge of the authors few reports of its utilization are available.

Care must be taken to avoid loss of seeds of many plants in this group following the dehiscence of the ovary. One solution of the problem is to gather the pods just before full ripeness and place them on well aired trays to open.¹ The bagging of seed pods is another solution which is satisfactory for the relatively small lots of seeds desired in most plant breeding.

Alternating temperatures may possibly be helpful in germinating some seeds in this group. For instance, although most seeds of *Alstroemeria* require no special treatment, seeds of *A. aurantiaca* D. Don. germinated best when held at 77°F. for two months and then at 50°F. for one month, the germination taking place at the lower temperature (16). According to Hannibal (11), however, the seeds of this species require stratification at 45°F. or lower.

The need for stratification is not common in this group, and may be confined to seeds of certain strains of hybrids. Thus seeds of most hybrid *Hemerocallis* require no stratification, but some need it for satisfactory germination (26). Seed pans which do not germinate in a period of several weeks should be placed at once in a temperature slightly above freezing for six weeks. The need for stratification is especially common among the pink types.

Unfortunately, the light requirements of the seeds of amaryllids have not been studied extensively. In general, experience at the U. S. Plant Introduction Garden has shown that reduction of light accelerates the germination of amaryllids. A possible exception is in those sorts, such as *Haemanthus*, which show a tendency toward vivipary.

The extensive experiments of Kinzel on light requirements of *Liliaceae* have been summarized by Crocker (7). Kinzel found that germination of the majority of species which he studied in this family was favored by darkness, although some species were favored by light. In his studies with the genus *Allium*, he found that seeds of *A. ascalonicum* L., *A. cepa* L., *A. moly* L., *A. porrum* L., *A. schoenoprasum* L., *A. ursinum* L. and *A. victorialis* L. germinated best in darkness. On the other hand, seeds of *A. schoenoprasum* var. *sibiricum* (L.) Hartm. and *A. suaveolens* Jacq. germinated best in light.

According to Stinson (24) seeds of *Alstroemeria* require the light of the sun to germinate, but those of *Bomarea* must be protected from the direct rays of the sun to germinate successfully. Our experience with seeds of *Bomarea* substantiates these observations. With all of the amaryllids, light should be increased after germination in order to strengthen the cotyledon and prolong the time during which the seed can aid in nourishing the young plant.

Probably methods of storage could be devised which would prolong the viability of the seeds of amaryllids. Thus a few years ago, stocks of onion seeds over one year old were considered unsatisfactory for producing commercial stands. This led to very high prices for the seed in years following crop failures. However, by drying the seed to a low moisture content and by storage under reduced temperatures with a low relative humidity, the seed could be kept for several seasons (2).

¹ See *Herbertia* 9: 181, 1942; and also article by W. M. James—A Decade with Amaryllids, in this issue (1943).

Seeds sealed in a dry tight container held at 20°F. were kept for seven years without noticeable deterioration. The importation of seeds of amaryllids has often been unsatisfactory and doubtless some attention could well be paid to the results of certain modern experiments on prolonging the period of viability of seeds. The seeds of tropical amaryllids are said to be injured by freezing.

METHODS OF SEEDING

Seeds of the many plants of this group which have been grown at the U. S. Plant Introduction Garden have usually been germinated on sphagnum moss, a method which has been explained previously by Close (4). This seeding medium has many excellent qualities, and prevents the appearance of damping-off, but soil is often quite satisfactory, since the seeds of amaryllids are not usually susceptible to disease. When seeds are germinated in the greenhouse or in frames, decay-resistant flats such as those of sheet metal, concrete or ceramic ware are highly advantageous for many sorts which are slow growing and may remain for two years without transplanting. Seedlings of *Narcissus* are an example.

If the seed beds are outdoors, a well drained friable soil should be selected. Porosity and good aeration are always advantageous, but some of the species grow best under special conditions of acidity, organic matter and mineral nutrients. Animal manures should be used with great caution, and are best applied during the previous season during the growing of preparatory green manure crops. Chemical fertilizers can be used with care and frequently the formulas and applications for the growing of ornamental bulbs are patterned after the methods used in the potato growing of the region.

The three foot "Dutch" bed is excellent for the production of seedlings of bulbs, although it has been largely displaced by the row system in the newer large scale production methods now used commercially in this country. Production of bulbs is becoming localized in the Pacific Northwest and also in California and Florida where favorable growing conditions or a long season makes competition from less favored regions difficult.

Propagation by seeds is the best method with a great many sorts, since many members of this group of plants produce offshoots sparingly. Of course, the use of seeds is impossible with many choice hybrids since they do not come true.

NATURAL VEGETATIVE MULTIPLICATION

Vegetative propagation by offsets is so slow in some of the plants of this group as to be almost useless, as for example, in some of the crinums. The rate of multiplication is often quite variable within a genus. Thus most species of *Haemanthus* produce offshoots rather sparingly, but *H. albiflos* Jacq. and *H. brachyphyllus* produce them rather freely. *Urceolina*, *Stenomesson*, *Cyrtanthus*, *Phaedranassa* and others multiply rapidly. The natural increase is likewise sufficient for commercial production of *Narcissus*, although some varieties have an unfor-

unately slow rate of multiplication. Division is used with *Alstroemeria* successfully, but the process is somewhat wasteful since many of the roots are broken and lost.

In cases in which natural vegetative increase is adequate for multiplication, the problem becomes one of promoting and increasing growth. Certain responses to fertilizers have been observed by the Dutch and American bulb growers although further experimentation is needed. An interesting example of the effect of mineral nutrients on multiplication is noted in the experiments of Traub and Hughes (35) in which an increase in number of bulbs of *Zephyranthes* took place with both a high concentration of nutrients and with starvation, although the size of the bulbs was satisfactory only in the former instance.

Aside from cultural practices, the means of increasing vegetative growth are few. The use of supplementary lights during the active vegetative period may be used to aid in working up a stock of valuable sorts quickly (27). The depth of planting is an important factor in regulating the rate of increase of some bulbous plants. Shallow planting often tends to favor a rapid increase; and deep planting, to decrease it (20).

Aside from the offsets normally produced by the bulbs or roots of this group of plants, some unusual types of multiplication are found. Thus in *Hemerocallis*, scape proliferations often form roots while on the plants. These may be removed and used to produce increase, but are not common except on certain varieties (Plate 249).

INTENSIVE METHODS OF VEGETATIVE MULTIPLICATION

Since many of the amaryllids have a natural rate of vegetative increase which is too slow for practical commercial purposes, in recent years there has been much interest in artificial means of propagation involving in all cases a cutting of the meristematic tissues to produce a greater number of functional units. In this family and in closely related plants, the meristematic tissues are much less widely distributed than in the *Liliaceae* and are found in the bulbous types only at the basal plate. Therefore some types of propagation used with other bulbous plants cannot be followed. In the *Liliaceae* for instance, even the upper portions of bulb scales of many plants such as the red squill, *Urginea maritima* (L.) Baker, will often produce new bulblets. Leaf cuttings can be used for many members of this family such as *Lachenalia*, but have few possibilities with amaryllids. Some of the possible methods of artificial reproduction will be discussed in detail here.

Excision or destruction of the terminal bud. This method is seldom used in a practical way but is included for the sake of completeness. It would doubtless be usable for many plants. The time for applying the treatment varies somewhat according to the species of plant. Heaton (13b) killed the buds of plants such as *Clivia* by heating the tip of a No. 12 wire or a knitting needle to a dull red color and plunging it through the stem axis of the bulb, starting at the growing point. The operation is done quickly to avoid damaging more than the bud cells. *Hemerocallis* may be treated by pressing a hot wire through the side of the stem at an angle which will intersect the growing point.

A variation of this method known as "coring" has been used in which the growing point is excised without destroying the basal plate, using an ordinary apple corer. The advantage claimed for this method has been the greater freedom from rots during the period of incubation (10).

Scoring or basal incision. This method of artificial propagation is the one used to some extent in the commercial production of Hyacinths. In scored bulbs, the new bulblets arise on the basal plate of the bulb, between the scale axils. One possible disadvantage of scoring as a means of commercial production is that the bulblets produced are quite variable in size.

The operation of scoring is done by making several perpendicular cuts across the bulb deep enough to extend a little beyond the growing tip of the bulb. With this method, the drying out of the cuts in starting incubation is sometimes a problem, since they are not well exposed to the air and decay may start. A satisfactory method is to pack the incised bulbs in dry sand and keep in a warm greenhouse or shed. A moderately high temperature should be maintained during the period of incubation, preferably above 70°F. However, with some bulbs the incubation period can be eliminated with safety under good growing conditions and they may be planted immediately.

Hayward (12) scored bulbs of *Lycoris* in September and obtained up to a sevenfold increase by the time of the blooming season in the following June. He considered this to be about three times the normal increase.

Leaf scale incubation from scooped bulbs. This method has been used to a limited extent for propagating hybrid amaryllis, but is probably largely of theoretical interest since its use requires more skill than crown cuttage and demands somewhat higher incubation temperatures. It should be possible to use this with many amaryllids. The method has been described by Luyten (18). Good sized bulbs are scooped accurately, removing only the basal plate. Care must be taken with this operation since the meristematic tissue does not extend more than one third to one half centimeter from the basal plate. The bulbs are then cut in half lengthwise and the individual scales are then removed and placed at an angle in the rooting medium, keeping the convex side up. An incubation temperature of 25° to 28°C. must be maintained for several months.

Incubation of excised root plus bulb fragment. Heaton (14) has described a method of rapid vegetative propagation which has the advantage that the flowering of the mother plant is not necessarily hindered. Just before the period of active growth when the new roots developing from the bulbs are about three or four inches long, they are carefully excised with a sharp knife together with a portion of the basal plate of the bulb. These portions, when potted carefully in small pots and treated as young seedlings, start growth in six or eight weeks. Perfect drainage in the pots is necessary for success and the watering must be done carefully. A ten or twenty fold increase may be obtained in one season by this method with plants of *Clivia*.

Crown Cuttage. The recent introduction of this method of artificial propagation by Traub (28, 29, 30, 32, 33, 34) and Heaton (13a) has led to its application by commercial growers of certain amaryllids. Several advantages may be claimed for the method. It may be performed rapidly by persons having little skill or experience and lower temperatures are required than are needed for the incubation of leaf scales. In Florida lath sheds are entirely adequate. The method has been used with excellent results at the U. S. Plant Introduction Garden in working up stocks of such genera as *Sternbergia*, *Amaryllis*, *Lycoris*, *Phaedranassa* and *Narcissus*.

Bulbs should not be made into crown cuttings too soon after flowering or the scale leaf portions may die off. August or September is considered a suitable time for cutting of bulbs of amaryllis in Florida and later propagation has not been satisfactory. The bulbs are cut vertically, dividing them into quarter, eighth or sixteenth portions. These pieces are then separated into smaller portions along the scale leaf separations, taking care that each portion has a piece of the basal plate. The separated scales may also be cut into portions taking care that each has a piece of the basal plate attached. A single bulb can often be made to furnish nearly a hundred divisions. The cuts should be at right angles to the flat leaf blades with flat-bladed plants such as *Phaedranassa*. For limited propagation of a single rare bulb without disturbing flowering, a slice may be taken from one side of the bulb.

Coarse sand and peat in equal parts provide the best medium for incubation, but sand is satisfactory. The reaction of the medium should be circumneutral or only slightly acid and Traub (32) found the addition of some quarter inch mesh rock helpful. The cuttings are handled in flats for greatest convenience. The upper ends of the scales should be above the surface. Good drainage is essential, and failures are generally caused by either excesses or deficiencies of moisture. In Florida the flats are kept in the open from November to February and then moved into a lath house with half shade.

Hume and Watkins (15) found that crown cuttage was far more effective for multiplication of species of *Zephyranthes* than scooping or basal incision. The bulbs were cut in halves, quarters or eighths, depending on the size and were planted for incubation in cleaned washed sand in April. However, the treatments by scooping or notching improved the condition of the bulbs by aiding rooting, although few offshoots were secured.

Crown cuttings of *Hemerocallis* are successful (25, 33, 34) provided that no more than four to eight sections are made, although pieces as small as 1/32nd of the stem will occasionally sprout under favorable conditions (Plate 249). The crown of this plant thus behaves much as the bulbs of amaryllids. Crown cuttage may be performed at different seasons with this plant, but is generally best carried out at the beginning of active vegetative periods. The cuttings are incubated in sand and peat or in sand alone, although large divisions such as halves of the crown can be planted in outdoor nursery beds if they are given favorable conditions.

Crown cuttings may be made on plants left in place in the nursery row, but apparently the advantages are somewhat doubtful with many varieties (27). Still another variation is possible with outdoor plants. Leafy crowns may be removed with a small piece of the root attached, and this cutting may be placed in a rooting medium. New buds often arise where the crowns are removed. There are marked differences in the response of different clones of daylilies to all of these intensive methods of vegetative propagation.

PLANT GROWTH SUBSTANCES

Oddly enough, in spite of the recent popularity of this field of investigation, almost no information is available regarding the effect of growth substances and vitamins on the behavior of amaryllids under artificial methods of propagation.² Doubtless certain growth-regulating responses could be obtained. One commercial grower of daylilies has stated that a commercial preparation containing both plant growth substances of the auxin type and certain vitamins was useful in starting crown cuttings under his growing conditions. Evidence to substantiate this observation has not been obtained from other sources thus far.

SIZE OF VEGETATIVE UNIT AND GROWTH RATES

Virtually no experimental data is available on one of the most important questions related to the propagation of amaryllids by artificial means, namely: in working up a stock rapidly, are fewer, relatively large vegetative units more or less efficient than numerous smaller units of the same plant? Probably the answer will depend on the growing conditions which are to be provided. Even under the best conditions, the hazards to the young plants increase greatly with extensive subdivision of the vegetative parts.

British daffodil specialists have had some difficulties in attempts to increase stocks of rare and valuable sorts by artificial means. Correspondence with several of the largest growers of daylilies in the U. S. A. has revealed that they have found little real saving of time in production of these plants by intensive methods of vegetative multiplication and are now relying largely on special preparation of the soil together with ordinary methods of division. On the other hand, crown cuttage is remarkably effective in speeding up propagation of such plants as *Sternbergia* or hybrid amaryllis. Apparently some careful quantitative experiments are now needed to determine the plants which will respond favorably to artificial methods of propagation and also to what extent the vegetative units should be subdivided.

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² See *Herbertia* 5:199-200; Plate 74. 1937 for some preliminary experiments.

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RAPID MULTIPLICATION OF LYCORIS AUREA

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At the request of a florist-grower, stem cuttage, as a means of rapidly increasing *Lycoris aurea*, was attempted in the autumn of 1942.

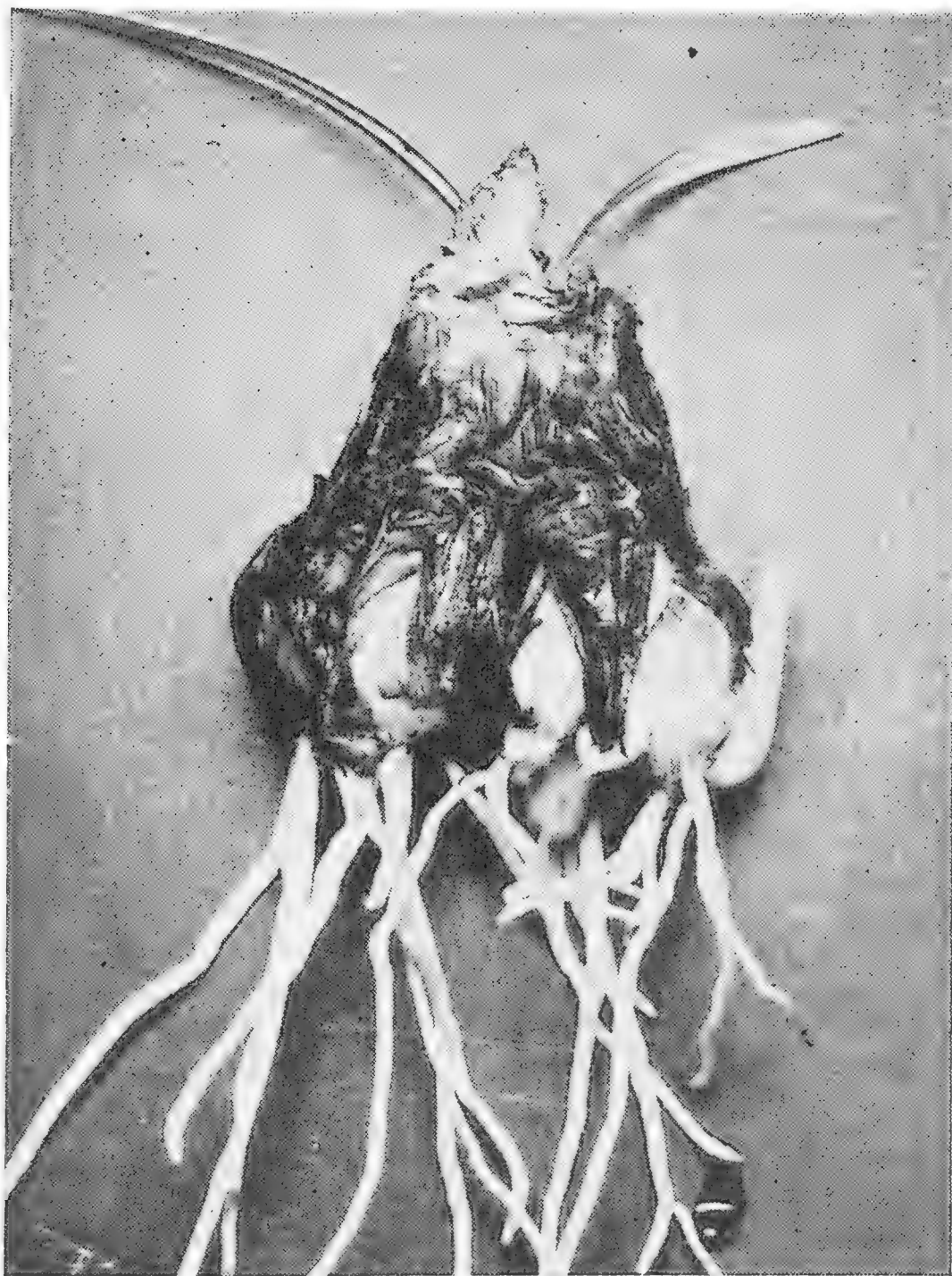


Fig. 105. *Lycoris aurea*: bulb nine months after cutting to induce bulblet formation.

This gardener had acquired a large stock of the golden Hurricane Lily and was anxious to learn if it would be possible to build up a commercial supply by vegetative means.

Twelve flowering bulbs were received from this grower in September 1942 and were divided into three lots. The bulbs of the first lot were cut into small pie sections as suggested for amaryllids by Traub (3, 4, 5, 6) and Heaton (2), and for *Lycoris radiata* by Hayward (1). The bulbs of the second lot were cut after the method described on page 27 of the writer's bulletin on the propagation of ornamental plants (7),—"several longitudinal *upward* cuts are made through the center of the bulb, about three-fourths of the way to the neck. This bulb, intact, but with many longitudinal cuts, is planted in a box of . . . sand to about three-fourths its depth." The bulbs of the third group were planted in the same flat as controls, and the sand was kept on the dry side, only sufficient water being added to keep the medium from becoming powder dry. Leaves began to emerge in the early winter and these functioned in a normal way during the growing season.

It is evident that *Lycoris aurea* differentiates its flowers during the spring before the rest period as blossoms were forced from those bulbs that were not too badly mutilated.

The illustration, Figure 105, was made from a photograph taken in June (1943), and the bulbils were divided and potted separately in three-inch clay pots. These pots were plunged in the sand of a lath house bench and were watered in the usual way. A careful count made eleven months after cutting, revealed that there were 90 healthy, growing bulbs from $\frac{1}{2}$ to $\frac{3}{4}$ of an inch in diameter.

Apparently the Hurricane Lily, *Lycoris aurea*, responds well to stem cuttage and the technic should have commercial possibilities.

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5. AMARYLLID CULTURE

REGIONAL ADAPTATION, SOILS, FERTILIZATION, IRRIGATION, USE IN LANDSCAPE, DISEASE AND INSECT CONTROL, ETC.

THE RICE HYBRID AMARYLLIS

ERNEST BRAUNTON, *California*

Every year, during the "merry month of May," all amaryllis fans and admirers of high color display in broad acres of flowers visit the bulb farm of W. E. Rice, near Los Angeles. Really it is a dozen miles from that metropolis, near the little city of Downey.

There the Rice's have 20 acres devoted entirely to bulbs. Mrs. Rice looks after selection of seed parents and supervises other technical work. They make a perfect working team. Five acres are given over entirely to hybrid *Amaryllis* (See Plate 250), and also two smaller fields where selections for color are being segregated, some of them named varieties. The two most outstanding Rice contributions are no doubt *Lady Helen*, a deep blood red, and *W. N. Campbell*, equally red and white, striped, both of large size and very full petalage.

Those of us who have watched Mr. Rice's notably successful career with *Amaryllis*, believe it comes largely from proper preparation of land and feeding. Of course, the naturally sandy loam is a big asset, but it has been tilled and enriched until it is in ideal condition for any crop.

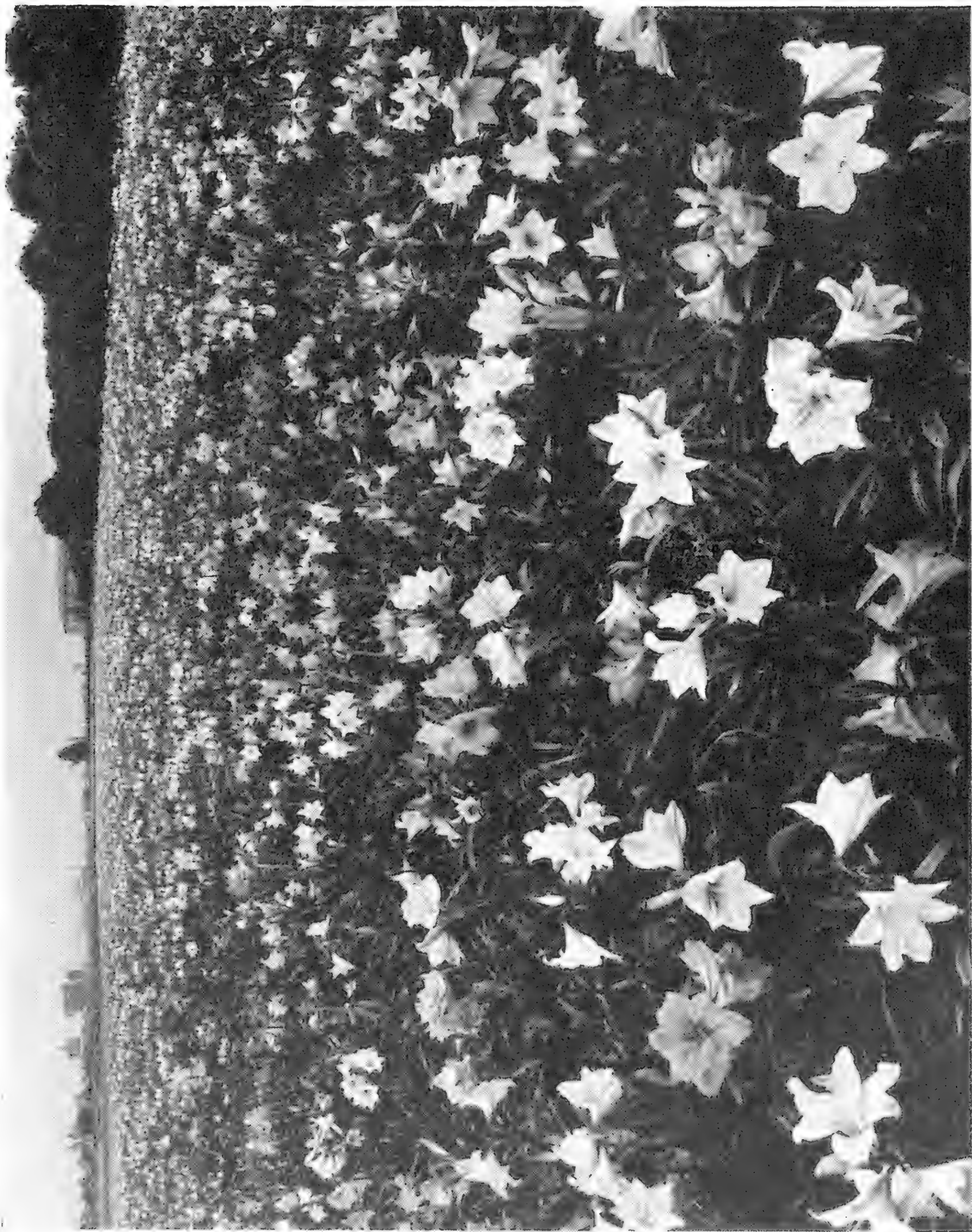
On the main field were spread twenty-five tons per acre of dairy manure, disced in and worked over several times. Then furrows eight inches deep and two feet apart were made and a light cultivation given furrow bottoms to make a soft bed. A special machine was run over the field to make a mark in the furrows every four inches. On each mark a man dropped a bulb while another roughly covered them. Then a tractor was run between rows to cover bulbs and leave a deep furrow for irrigation.

After new growth was made commercial fertilizer, 12-16-12, was applied—two tons to the acre. This carried them over to the following spring. However, much water and cultivation was given, the latter mainly for weed control. In autumn four inches of rabbit manure was applied and left for winter rains to carry down, a heavy feed that brought equally heavy floral response.

In the first flowering season each bulb and its major offspring sent forth a flower spike, great numbers were more than three feet high, on sturdy stalks. A number carried six flowers to the spike and some flowers had eight petals each.

It is believed that this main bed is one of America's largest devoted to a single strain of *Amaryllis*. The colors range from pure white to nearly black—the latter named *Zulu* by Mr. Rice.

This high-grade stock did not come into being without preparation. It came from seeds selected from the cream of 80,000 bulbs, many of them purchased from both amateurs and professional growers. Seeds



The Rice Hybrid Amaryllis

are sown in beds, covered with shading material, and after germination are left in place for one year, when they are transplanted to more permanent quarters. A selection of new and better types is constantly going on. Excellence, and not size, is the Rice watchword.

NOTES ON AMARYLLIS

L. S. HANNIBAL, *California*

From time to time, like most collectors, the writer has added various species and hybrid *Amaryllis* to his collection, but the San Francisco area cannot be considered as subtropical, being 200 miles North of the citrus belt, thus all specimens do not prove up entirely satisfactorily. In some cases outdoor plantings are possible, but normally an unheated glass house is required. Even here sub-tropical species such as *Amaryllis rutila* and the varieties *fulgida* and *crocata* seldom bloom, and trouble from bulb rot is often experienced during the cool moist winters. However, seedlings of the latter species which were raised from seed imported from Sao Paulo are hardier and seem more promising. Hybrids such as the *Garfieldii* hybrids and a Hayward Dutch-white X *fulgida* also seem to require warmer and drier winter conditions. So far they have been shy bloomers, but the *crocata* blood in the *Garfieldii* hybrids tends to induce a production of numerous offsets—perhaps sufficient bloom can be obtained by sheer mass of bulb population.

In contrast *A. aulica* var. *major* does well here and seems quite at home. Its stiff rigid bloom is quite striking when it occasionally flowers during early spring. The smaller variety *robusta* is either a very shy bloomer or else it desires a warmer latitude, as I recall it has been reported as doing well in Florida. Hybrids of *A. aulica* flower easily, but the bloom are of little value due to excessive green in the throat.

Amaryllis Johnsonii is also quite hardy and will do well in outdoor locations, even in heavy clay soils. Last year the writer imported several *A. reginae* bulbs from Austin Smith of Costa Rica. These turned out to be very hardy, and very similar to *Johnsonii*, the only distinction being that the stigma lobes are slightly longer and the flowers appreciably fragrant. The bulbs seem stoloniferous when planted deep. Could this be a *Johnsonii* variation?

Amaryllis belladonna Linn. (syn. *Hippeastrum equestre* Herb.) from Florida and Cuba is another that objects to wet conditions in the winter, but as this species is very variable in source and form, it has not been difficult to locate a few hardy specimens; even so members of this group seem to be shy bloomers for this area.

Amaryllis solandriiflora var. *conspicua* (See Fig. 106) does fairly well in central California. The plant seems to be nearly sterile due to climatic conditions, but fortunately the writer succeeded in having one bloom take *Johnsonii* pollen. The half dozen seedlings which resulted seem quite hardy and show growth characteristics favoring one parent or the other.

Apparently Luther Burbank obtained some of Nehrling's fragrant Hybrid *Amaryllis* seedlings, and in turn hybrids of these were part of

the foundation stock of Hermon Brown's beautiful, and fortunately very hardy strain. A number of these have the almond fragrance which is so characteristic of *Solandriflora*. Of the hybrids, those of Mr. Brown and the late Mr. Diener seem to be the hardiest here. Some of the types such as the Mead strain, which do so well in Florida, find our wet winters and dry summers, (with the hot days and cold nights) anything but favorable.



Fig. 106. *Amaryllis solandriflora* var. *conspicua*. Photo by L. S. Hannibal.

Amaryllis psittacina and the variety *decorata* seem fairly hardy and grow quite readily, but rarely bloom. The same applies to *A. solandriflora* var. *candida*. These are all warm climate plants, and all require glass the year round, although such is not the case further south.

In 1941 Herbertia Dr. Traub asked for information on the linear-leaved, small-flowered *Amaryllis* such as *Amaryllis advena* var. *miniatus* which is extremely hardy. *Amaryllis pratense* is likewise quite hardy, in fact it has been reported resistant to 12 degrees F. and grows best

when *Narcissus* culture is used in a well drained sandy soil. Summer heat checks all growth.

Amaryllis bicolor comes from northern Chile where temperatures range from 70 to 90 degrees F. the year around. It has not been a success as it needs too much heat, as well as a well drained, nearly dry, sandy soil. The same applies to a small yellow-orange variety that came from Dr. Reed's collection at Valparaiso [See Plant Hunters of the Andes. T. H. Goodspeed (1941)]. The writer also has one or two other linear-leaved specimens that have not been identified as yet, but they do seem hardy.

At best one can expect the most promising results in this group to come from material that is found in Southern Chile, or the high mountains. Due to little seasonal change in temperatures any material from Valparaiso, or north of there, is likely to be found quite temperamental in growth habits, and as any collector will soon learn when he deals with amaryllids—if natural environment can't be approximately duplicated one is likely to come out on the bad end of the deal.

To obtain flowers from reluctant bulbs often requires more than a general knowledge of the bulb's growth requirements. Often somewhat previous to a bulb's normal flowering period a dormancy or rest period is essential, which represents the formative period for the bud and future foliage development. Whether it be *Narcissus*, Hybrid *Amaryllis*, *Nerine*, or a score of other well known genera the same generalities apply: a prolonged rest period in the specific temperature range, as desired by the bulb in question, is most effective in promoting early bud growth, and rest period in the proper season when temperature and humidity conditions, especially the former, approach the range which is normal to the requirements of final bud development, will lead to flowering. Many species will tolerate a longer than normal rest period and produce very fine bloom, but few deciduous bulbs will respond with flowers if the rest period is shortened, or if temperatures drop much below the bulb's accustomed range, for in either case proper bud formation cannot take place and we usually have no bloom at all, or a very poor aborted bloom.

Root disturbance can be cited as another reason for poor flowering response. Many bulb species, even if they appear dormant, often continue active root growth while top growth is absent. We can only surmise that bud development is affected by root destruction, not with every species, but often enough to make it desirable to avoid as much root disturbance as is possible during transplanting time. There are other factors such as the red rust, bulb fly, poor drainage, etc. which check bloom by bulb destruction; however, these secondary effects are usually overcome by proper culture for normal plant development. It is the failure to understand, or to provide proper conditions which gets the collector "down" when a bulb fails, for success depends upon providing the proper environment.

NOTES ON AGAPANTHUS CULTURE

J. N. GIRIDLIAN, *California*

The only species of *Agapanthus* that is well distributed in this country is *A. Orientalis* (syn. *A. umbellatus*) and its varieties. This species was introduced many years ago and is known as the Blue Lily-of-the-Nile. In most parts of the country it is grown as a house plant, under glass or in the conservatory in large tubs or pots. In the Southeast and Western Coast it is grown in the open, and in Southern California it is one of the most popular perennials. There is hardly a home that does not boast of one or more plants.

My experience with *Agapanthus* is confined to my own garden and what I have observed in the local gardens in Southern California. Here they are grown in huge beds, borders and as single specimen plants. Once they are planted they seem to be as permanent as a shrub and each year they grow in size and beauty. I have seen them growing in beautiful estates where they are given the best of care and in the homes of the humble where they are hardly noticed until they are in flower, and I must admit that the latter grow and flower far better. Here seems to lie the key to the successful culture of *Agapanthus*, and I have followed it for the past seven years with very satisfactory results.

In my garden the main planting is in an out-of-the-way place back of the glasshouse where they are not apt to receive any care except what I deliberately give them. Here they are allowed to more or less shift for themselves. They were planted here as seedlings, in double rows with the rows three feet apart and the plants six inches apart in the row. The soil is rich and heavy and when dry it is hard as a brick. Since setting them out six years ago they have never been cultivated, and watered by overhead sprinkling but once each summer which is the full extent of the watering they have received except our seasonal rainfall in the winter. They have never been fertilized or, after the first year, weeded. This latter has never been necessary since the plants have grown so tall and heavy that weeds simply do not get a foothold. This would seem to paint a picture of a neglected garden with sickly looking plants but the contrary is true. The plants that I have placed in my perennial border receiving the regular garden care with cultivation, and sprinkling at least twice a week, are no better looking and certainly do not flower half so well. This past season the average height of the flower stems was over five feet with many of them over six and one measured eighty inches high.

Agapanthus produce a prodigious amount of thick, fleshy roots that lie just under the surface and any digging and cultivation is sure to damage them. This may be one reason for their optimum development in my garden. Also, in line with many South Africans, a good baking in the summer sun seems to ripen the plants to productivity. Any stimulant either in form of water or fertilizer which encourages foliage growth seems to be at the expense of flowers. Of course eventually there will come a time when the soil around the plant will be depleted of all food available to the plant and it will fail to bloom, but that will take

about ten years and until then it is a good policy to use very little if any fertilizer. Of course one must use some good judgment. In very poor or very sandy soils more water and food will be beneficial. Also when grown in containers an annual or semi-annual application of liquid manure will be found necessary as the soil will leach out.

There are many new species and varieties available now and although some of them are very different from the common varieties the cultural requirements seem to be fairly alike for all except the species that are deciduous. These are totally dormant during the winter even in our warm climate and do not start to grow until after our rainy season is nearly over. They should be well watered until after they are through blooming, particularly *A. pendula* which blooms a month later than the others and well into August. Unless watered well the flower spikes do not seem to develop to their full stature, and the florets are smaller.

I think that the deciduous species are the answer to the commercial florist's dreams, and the logical species to grow in cold climes. They are naturally hardier than the evergreen kinds, but they have the advantage that they may be grown in the garden and lifted and stored during the winter the same as is done with Dahlia tubers. Then the gardener may plant them out in the spring and they will grow and bloom as if nothing had happened. The florist can plant these under glass and force them into bloom. They may also be placed on the store counter and sold as dormant bulbs.

Some of the varieties seem to require special treatment to get the best results. The variegated variety seems to develop the variegation best when planted in the shade. The double flowered variety should not be watered overhead when in flower. The doubling is so complete and the petals so dense that any moisture penetrating into the flower does not readily dry out and causes rot and the flowers fail to open.

Propagation of selected clones is by vegetative means, the simplest way being to break up the old clumps to single plants. Otherwise the best and most interesting way is to grow them by means of seeds. Fresh seeds germinate readily and some flower the second season and nearly all the third. I have been told of *A. africanus Moorianus* var. *minor* blooming the first year from seed. The seeds may be placed in pots or flats very thickly and left in the same container the first year. One year old plants are very easy to handle. These have formed large enough rhizomes so that the percentage of loss in transplanting is negligible.

The breeding of new varieties in this field has been sadly neglected. With the new and varied species now available the possibilities of breeding is unlimited. We need longer blooming season, wider color range, twice blooming habit, compact growing plants, large individual flowers for corsage use, thin and graceful stems for cut flower use, and many, many more desirable qualities that are not too hard to obtain. Purple, lavender, pink, sky-blue and even yellow are not beyond the realm of possibility. We already have creamy whites and by selection yellow color should not be far off. We need graceful, dwarf plants whose flowers are in good proportion for the use of people that do not have

much room to spare in their window gardens. Also by selection the breeder should be able to widen the sepals and petals until the flowers are more nearly like the hybrid *Amaryllis* in shape. As for cross pollination, just plant your selected parents close together and the bees will take care of it for you.

NOTES ON TULBAGHIA VIOLACEA

J. N. GIRIDLIAN, *California*

Tulbaghia violacea (See Plate 166, HERBERTIA 1939) has proved itself to be well suited to the warmer sections of the United States. At least it has been successfully grown all along the Gulf and Pacific coast states. This is not to be taken as meaning that it will not succeed in other parts of the country. Although I have not found out just what its limit of endurance to cold is, I have reason to believe that it is much more hardy than is commonly supposed. This is simply because it is quite new and has not been given a sufficient trial. There is a prevalent idea that anything South African is very tender and the gardeners in our colder states do not take any chances. This assumption is not necessarily true. Like some of our own California natives, some of the South Africans that grow in high altitudes are subjected to occasional severe frosts, and will succeed in colder sections.

I also believe that there must be other *Tulbaghia* species that are hardy but which are not in cultivation in this country. This is not because we have not tried to obtain them. It seems that even in South Africa *T. violacea* is the one species commonly cultivated. While nearly anyone will send seeds of this species no one seems to be able or willing to send seeds of the other species. I suppose that the twenty-four or more species reported exist mainly in herbariums as dried plants. This situation is to be regretted because I understand that many of the species lack the *Allium* odor, that is the only drawback to the universal culture of *T. violacea*, and some are even fragrant.

I had my first experience with this plant some fifteen years ago. A packet of seeds was sent to me. They sprouted readily and flowered the second season. Ever since I have been doing my best to have everyone grow it. I have grown it under many varied conditions without any failure. If there is any flowering plant that is so easy to grow and has so many good qualities to recommend it I would like to know what it is.

Ideal conditions for its culture seem to be constant moisture, full sun, a soil rich in humus and an annual top dressing of manure. However it will succeed surprisingly well under adverse conditions. It will grow to perfection in any kind of soil if other conditions are good. It will grow and flower constantly under the driest conditions, although naturally the plant will not have a luxuriant look. Just to illustrate how much drought they can stand—they may be dug out of the ground, divided, the tops cut off, dried off and left in that condition in a shady place for several months, but they will start to grow immediately upon planting. For purposes of selling at store counters this is a good quality.

They will reward the gardener for any extra care in their cultivation by luxuriant growth and more flowers. The best clump of plants I have is from a six year old seedling in a rock garden. It is on the east side of a house where it receives afternoon shade. This clump is now two feet across and is never without flowers.

A single plant in an isolated spot will not set seeds but when planted in groups large quantities of seeds will be produced. If allowed to ripen and scatter, these seeds will sprout readily and cover the ground around the plant with a grassy carpet. If wanted, these may be transplanted when large enough to handle. If not, a single application of a



Fig. 107. *Ammocharis heterostyla*. Photo by W. M. James. See page 158.

hoe will eradicate them. They do not become a pest. If the flower stems are cut off as soon as the flowers fade the plant will look much neater and twice as many flowers will result.

In the garden *Tulbaghia violacea* may be planted in rows, beds, or singly. If planted eight inches apart they will cover the ground in about three years. They may be left in the same location for many years as they do not exhaust the soil if an annual feeding is given. They make good pot plants when good drainage is provided.

The most pressing need of this plant seems to be a suitable common name. The botanical name is not attractive and means nothing to the average person. The common name "Pink Agapanthus" does not fit the plant. It is neither pink nor does it resemble *Agapanthus* very closely. It is more often associated with the *Alliums*. It is hoped that one of these days someone will suggest a name that will do the plant justice and will help popularize it.

AMARYLLIDS AT RANCHO RINCONADA, 1942-1943

W. M. JAMES, *California*

Ammocharis Heterostyla. This is the first *Ammocharis* I have seen in bloom. Although the flowers last only a few days, they are pretty and have a delightful fragrance. They are white the first day, changing to a dark pink in a day or two—one and one-half inch in diameter with a tube two inches long, one-eighth inch in diameter, with the anthers hung across the opening of the tube and the stigma at least three-fourths inch below the anthers. The flowers in the picture (Fig. 107) appeared



Fig. 108. *Nerine masoniorum*. Photo by W. M. James.

in early fall just before the leaves started to dry up and are on very short pedicels in an umbel of four to six, on a stem about two and one-half inches long.

The leaves are green, more or less flat, somewhat sickle-shaped and arranged in two rows, one on each side of the center of the bulb. The picture (Fig. 107) shows the distinctive manner of growth fairly well.



Upper, *Nerine falcata*; lower, *Nerine flexuosa*
Photos by W. M. James

More Nerines. Late last summer I had the pleasure of seeing four new (to me) *Nerines* bloom—*Nerine Masoniorum*, *N. lucida*, *N. flexuosa* and *N. falcata* (Plate 251, and Figs. 108, 109).

N. Masoniorum is a delicate little one, with thread-like leaves (Fig. 108) and is very similar to *N. filifolia*, except that it is smaller in all parts. It multiplies rapidly by offsets and sets seed very freely.

I understand that *N. lucida* is from or near the Karoo where there is only about five inches annual rainfall which comes in the summer. Last summer the flowers lasted about the same length of time as those of the other *Nerines*, but the seeds matured much quicker, were planted immediately and were germinating almost before the seeds of *N. flexuosa* and *N. falcata* had fully matured.

All three bloomed in late summer, about one month before the English hybrids. The flowers are on comparatively long pedicels in very large umbels. The outer flowers of some of the umbels had ripe seeds before all the flowers in the center of the umbel had opened.

N. lucida has pink flowers about two inches in diameter in an umbel of twenty to forty on a short stem. The stem slips out of the bulb very easily and I believe in its native habitat is blown along the ground scattering seed as it rolls along. Although the flowers are not as bright or showy as are those of other species and hybrids, they are attractive in themselves (Fig. 109).

N. flexuosa and *N. falcata* are found farther east than *N. lucida* where there is more rainfall. The leaves grow during the summer and the bulbs are dormant during the winter. In their native habitat they would receive little or no rain during their rest period in the winter.

The foliage of both is dark green, nearly flat and is arranged in two rows on each side of the center of the bulb (bifarious) and resembles that of *Ammocharis* much more than it does any of the other *Nerines* (Plate 251).

The flowers are not particularly attractive (in comparison with some of the others)—both are light pink with a greenish stripe in the center of the petal and are on comparatively long pedicels in an enormous umbel. The stems are one and one-half to three feet long and are more or less flat with two sharp edges in contrast to the round stems of the other *Nerines*.

N. flexuosa has been used as a parent by some of the English hybridists. I do not know yet whether it produces sterile hybrids or not. If the size, vigor and number of flowers of these three *Nerines* could be combined with some of the brighter colors of the other kinds, we should have some very attractive plants, and flowers.

As this copy is being mailed, in early July, *Nerine flexuosa* and *N. falcata* are in full bloom and *N. lucida* has buds which will open in a week. These bulbs were left in the open ground and received over 20 inches of rainfall during their dormant period last winter. If they will do this regularly, it will indicate that we still have something to learn about *Nerine* culture. And the ecologists will probably say that these bulbs tolerate the climatic conditions of their native habitat in South Africa rather than actually require them.

New Amaryllis Hybrids. In the summer of 1940 *Amaryllis* "Diener's Everflowering" were crossed with *Amaryllis candida*. Six plants from this cross flowered in May 1943 and show some promise.

Diener's Hybrids were used because they were the only flowers in bloom at the time. The plants used were not particularly outstanding, but were chosen from a large group of seedlings because of their early flowering from seed, vigor, habit of blooming several times a year in the open ground in Santa Barbara and the large bulb increase.

The new hybrids show some desirable characteristics of both par-



Fig. 109. *Nerine lucida*. Photo by W. M. James.

ents. One plant had two flower stems with five flowers each of an orange shade. One of these stems was two feet tall and the other three feet (Fig. 110). Small leaves around the parent bulb indicate at least a dozen offsets. There were two plants with almost pure white flowers. The only color was in a small, short red stripe on the center of each petal deep in the throat. The white is a clear shade without a tinge of any other color. One of these "whites" had a flower stem three feet tall and small leaves indicate there should be several offsets. All flowers

were more or less intermediate between those of the two parents (See Plate 183a HERBERTIA 1940).

Trouble with seed production was encountered with this cross. To begin with, seed pods on *A. candida*, both from selfed flowers and from hybrid flowers, dropped off after they were about one-half grown. Not a single seed was obtained from *A. candida* from flowers pollinated in two seasons. This dropping seemed to be caused by an abscission layer of cells at the base of the seed pod. About half of the pods on the Dieners Hybrids from flowers crossed with *A. candida* did the same thing. And the seed pods on the new hybrids are also dropping. It does not seem to make any difference whether the pollen was from the same flower or from the flower of another plant in the same cross. However, a few seed pods are developing so that the cross can be observed for another generation.

THE LESSER BULB FLIES IN AMARYLLIDS

L. S. HANNIBAL, *California*

In a recent publication by the USDA (The Control of Insects and Mites Attacking Narcissus Bulbs, Farmers Bulletin No. 1890), a very thorough discussion is available regarding the action of bulb flies in *Narcissus*. Two types are known, the large Narcissus Bulb Fly and the Lesser Bulb Fly. In many respects their life histories are similar, but the Narcissus Bulb Fly is found in a bulb as a single maggot, while the latter occurs in a colony. The writer has not experienced the Narcissus Bulb Fly here, but from time to time the Lesser Bulb Flies can be quite troublesome, not only in *Narcissus*, but in many other amaryllids.

The larvæ of the Lesser Bulb Fly very seldom infest a sound bulb—they prefer bulbs where decay is present, usually brought about by too much water or abnormal conditions for the bulbs during the dormant season. The larvae penetrate these bulbs working down the leaf stems from the soil surface. They may either stay for a short period and pupate, or they may remain there over the autumn and winter months before maturing. In either case serious destruction and decay occur in a bulb so attacked. The heart of the bulb is usually the center of activity and unless such an infestation is soon discovered the whole bulb rapidly becomes a black smelly, rotten mass. The preference for certain *Narcissus* types by the fly has long been known. The continued loss here of *Lycoris squamigera* and *Haemanthus multiflora* suggested that there possibly was a preference rating for certain amaryllids, with *L. squamigera* far in the lead. The following list gives a rough approximation of order of choice.

Lycoris squamigera
Haemanthus multiflora
Narcissus triandrus hyb.
N. Soleil d'Or
Lycoris radiata
Ismene calathina
Nerine spp.

Habranthus robustus
Phaedranassa Carmioli
Pancratum canariensis
Amaryllis hybridum (syn. *Hippeastrum*)
Haemanthus Katherineae
Narcissus, Trumpet types
Stenomesson spp.

Several means of control are possible to discourage the activity of the flies. *Lycoris squamigera* may be an excellent, but costly preferential bait, but with most deciduous bulbs that are summer resting, like *Narcissus* or *Lycoris*, deep planting and an early spring hoeing to remove the drying leaves makes it difficult for this pest to penetrate to the bulbs. If sand is sprinkled over the surface soil at the time the fly egg-laying period begins, in March, the penetration of the larvae to the bulb is retarded, but if Naphthalene flakes are worked into the sand an



Fig. 110. New Amaryllis Hybrids; Diener's Hybrids X Amaryllis candida. Photos by W. M. James. See pages 161-162.

excellent barrier is formed which no fly larvae will penetrate. This latter method is applicable to pots or large acreage.

If a valuable bulb is found infested it should be cut open, washed free of maggots and decay, packed with sand containing a few Naphthalene flakes, and returned to the bench for offset development. Offsets usually form very rapidly in bulbs that have the core removed. The Naphthalene prevents further decay action and repels additional fly

infestation. No sure method of elimination of the flies has ever been suggested. They prefer the cool coastal areas of California, Oregon, and Washington. Once they are introduced into an area they usually stay; however where the summer humidity is low and the temperatures soar to 95° or more, one can expect little or no serious trouble. I doubt that they exist more than 50 miles inland in central or Southern California.

LYCORIS SQUAMIGERA IN KANSAS

DARRELL S. CRAWFORD, *Kansas*

The refreshing, sparkling beauty of this hardy amaryllid in its sudden appearance in hot mid-August days is a miracle that revives the weary heart. It is never taken for granted once it is witnessed, but is awaited breathlessly each year.

Apparently the bulbs will sulk and not bloom if planted too deeply. Some planted thirteen inches deep in clay soil that baked hard in the full sun, produced short leaves, ripened off earlier and never bloomed. When these bulbs were moved to semi-shade in moist loamy soil, set six to eight inches below the surface regardless of their long necks, surprisingly profuse bloom was secured the next season.

The scapes grow six to eight inches a day to burst into flower at thirty-six to forty inches in height. Large umbels of seven to nine or more pink lilies with soft lavender tepal tips and mid-ribs continue to open for a week and last for two weeks. Tardy scapes will prolong the show several days. Protection of a shrub or tall perennial will prevent damage to the blooms from sun and wind.

Bulbs multiply rapidly, but stocks are scarce due to the very great demand. Bulbs must be lifted and divided every four or five years for they crowd and will become flat like table tennis paddles, and this condition definitely reduces the number of blooms.

The variety *purpurea* is also hardy in Kansas. It is seldom seen or offered for sale. It is similar to the type but even more beautiful. Blooms are a sky-blue exactly like the blue of *Mertensias* with a one-eighth inch border of rose-pink around each tepal and a rose-pink throat. This perfect blend makes a picture of rare beauty that will be eagerly sought when these rare bulbs are better known for blue is needed in the late summer garden. The buds are a wine red-lavender. The name *purpurea* hardly fits this amaryllid when in bloom. It is hardy here in Kansas and northward to northern Iowa at 20 degrees below zero. Abnormally wet seasons that cause dahlias and gladioli to rot do not affect either the type or the variety.

SPRING STAR-FLOWER, BRODIAEA UNIFLORA

DARRELL S. CRAWFORD, *Kansas*

Brodiaea uniflora, native to Argentina, is a charming April-flowering plant that should be better known.

Its common name, Spring (or Blue) Star-Flower, aptly describes the one-and-a-half inch pale blue stars with lavender mid-ribs that open flat at the end of six-inch peduncles. The flowers are borne singly and

remain open for several days but close at night. New ones always are ready to open as others fade. The variety *caerulea* has porcelain blue flowers, and those of variety *violacea* are violet. These latter I have not seen.

When planted three to four inches deep, it is perfectly hardy here in Kansas in sunny or shady places without protection. The grassy, narrow leaves make luxuriant four to five inch high mounds that are covered with blue stars for weeks. The foliage dies away in early summer.

As a double duty flower *Brodiaea uniflora* is priceless because it forces easily. If potted in late October one has the cheery blue stars week after week to whisper to one of Spring through November to January. All that is necessary is to pot the corms in a good soil mixture and water regularly. A sunny window is the best. There are no requirements for rooting in the dark, or for storage or growing temperatures other than those of the ordinary living room. This is ideal for the busy plant enthusiast.

In order to prolong the blooming period into February and March, a few dormant corms saved for the purpose, are added to each pot in January in spaces left for them. In April or May the growing plants should be lifted and planted outdoors to make their full growth and then to remain dormant until it is time to lift them again for potting. Thus there is no loss. The prolific increase of corms is the delight of the gardener.

Tested here six years ago for the first time, it has been my pleasure to help toward a more general appreciation of the little jewel in the Mid-West. No other plant has won such a high regard here for hardly any other gives so great a reward compared to the size of the subject and care it requires.

ALLIUM NOTES, 1943

SGT. BERNARD HARKNESS, *Chairman*
Allioideae Committee

The only contact that your Allioideae Committee chairman, who is at present with the Army Air Forces, had with the Onion Subfamily (Allioideae) of the Amaryllidaceae this past season was to observe in early August *Allium cernuum* at Watertown, South Dakota where it is fairly frequent along a railroad right of way and in sandy loam adjacent to Lake Kampeska.

In consequence he has called for contributions from all those known by him to be interested in furthering the horticultural interest in ornamental alliums. The resulting symposium will be a part of the 1944 HERBERTIA, the Allioideae issue. Undoubtedly there are gardeners whom this appeal has not reached; notes from them on their gardening experiences with alliums would be appreciated in order that we may have a broad geographical picture of the ornamental use of the genus.

At first the symposium contributors were asked to name the three best performing Alliums in their garden; with the Allieae issue in prospect the limitation to three was lifted. If the question were put to me,

I should choose *Allium flavum*, the dwarf form known as var. *minor*, for its fragrant yellow flowers in late June, *Allium pulchellum* with its cool mauve flowers in July, and grassy tufted, August flowering *Allium cyaneum* with its blue bells.

Mr. Harold Rugg of Hanover, New Hampshire writes that *Allium pulchellum* is one he likes and that he is fond of *Allium azureum*, which he has some trouble in keeping.

Mr. Montague Free of the Brooklyn Botanic Garden names *Allium neapolitanum*, *Allium narcissiflorum*, and *Allium tibeticum* as favorites.

Mr. Carl Starker of Jennings Lodge, Oregon has favored me with the following list of species which he has found to be easy and dependable and permanent with very little care:

Allium kansuense—six to eight inches high with very fine grassy foliage and lovely blue flowers in small heads. Nice in the rock garden.

Allium Moly—good in part shade, eight to ten inches. Broad glaucous foliage—somewhat like tulip foliage. Loose heads of large shining deep yellow blooms. Good in border or rockery.

Allium Farreri—Lovely in the rock garden. four to six inches. Rather broad blue-green foliage and drooping heads of wine-purple bells.

Allium neapolitanum—twelve to fourteen inches. Early and lovely, with showy pure white flowers with green stamens. Nice for cutting and a good multiplier.

Allium albopilosum—fourteen to sixteen inches. Large round heads of silvery lavender flowers, quite starry and open in effect. Especially effective and long lasting as a cut flower. Very large bulbs.

Allium triquetrum—flat three sided light green fleshy foliage and large long white bells marked with green in clusters of six to eight on a stem. Very early blooming, eight to ten inches.

Allium subroseum—charming round heads of bloom in August-September. Bright rose pink with no hint of lavender. Five to six inches.

ALLIUM AND NOTHOSCORDUM NOTES

F. CLEVELAND MORGAN, *Montreal, Canada*

[The following notes were submitted by Mr. F. Cleveland Morgan, Montreal, Canada, who is one of the outstanding plant enthusiasts in Canada. —*Bernard Harkness*]

A. albopilosum—from Persia—is rather large for the average Rock Garden but it is a handsome and striking plant. The flowering scapes rise about 2 feet and carry large globular heads of silvery lilac fully six inches in diameter. Even the seed heads are decorative and look, when dried, like an exploding bomb. The seeds are slow to germinate and the plant, unlike so many Alliums, never becomes a nuisance. It flowers about July 1st.

A. azureum (syn. *A. coeruleum*) *Siberia*. This species likes a hot dry soil and is one of the most attractive of the whole genus. The circular heads of two inch diameter are a wonderful blue and are splendid

as cut flowers for the house. They grow from 18 to 24 inches high. Flowers in June. It comes readily from seed.

A. Beesianum, *N. China*. A small species about nine inches high with small clusters of drooping blue bells carried on slender scapes. It has grassy foliage and flowers in late July.

A. carinatum (syn. *A. pulchellum*). A delicate and beautiful plant growing about 18 inches high. The flower head is not large and consists of a loose cluster. These heads are sheathed in a long spathe and as these open the rosy purple flowers appear on long pedicels. The effect is not unlike an exploding rocket. It blooms during July and August and though it self sows does not become a nuisance.

A. cernuum—*Allegany Mts.* I mention this species more as a warning than to recommend it as a desirable plant to grow. It is by no means the least attractive of the group but spreads dangerously by seed. The plant flowers in July and the heads consist of hanging pink bells in clusters on a 15-inch scape.

A. cyaneum—*Altai Mts. Siberia*. A charming little species with wiry grass-like foliage and tiny hanging bells of a soft blue. There are a number of other species coming from China which resemble it, such as *A. Kansuense* and *A. Sikkimense*. It flowers in July.

A. flavum—*Italy*. Soft yellow bells in small umbels on one foot scapes. Spathes very long and pointed. There are two forms of this plant one flowering a little earlier in July than the other and this variety is without the distinctive spathe of the larger variety. The flowers have a delicate fragrance though the foliage if crushed gives off the characteristic onion smell.

A. Heldrichii. The darkest and richest coloured allium which I have grown—the flowers being a deep wine red. It blooms in late June and grows to about a foot high.

A. karataviense—*Turkestan*. In this species the broad glaucous leaves are themselves very decorative but after the plant has flowered they fade and disappear. The leaves grow in arching pairs and from each pair appears in early June, the flower scape carrying a large round head of greenish white. It does best in a rather light sandy loam. The mature bulbs are round and measure a good two inches across.

A. Moly—(syn. *A. luteum*)—*Spain*. The Spanish onion has butter yellow flowers in small heads on one foot scapes. The foliage is broader than in most alliums and disappears after the plant has flowered. It will succeed in semi-shade and to be effective should be grown in colonies.

A. narcissiflorum (syn. *A. pedimontanum*). This is to my mind the most charming of the family. Its eight inch scapes carry pendant bells of rosy red, not unlike a snowdrop in character. The leaves are strap-shaped and the plant increases by running underground roots. Give it stony ground.

A. ostrowskyanum—*Turkestan*. This plant has a few strap shaped leaves and the flower scapes of one foot carry clustered heads of cheerful red-violet. It is a pretty species which comes into flower about July 1st. It is best propagated from seed.

A. stellatum—*Prairie Onion*—*Western States*. Though not spectacular this is a useful counterpart to interplant with the white *N. inodorum* described below. It flowers at the same time and its rosy purple heads look well by contrast in its company.

A. zebdanense—*Armenia*. A charming early bloomer (end May) with dainty bells of white hanging in small umbels from 15-inch scapes. The foliage is fine and grassy.



Fig. 111. *Brunsvigia Slateriana*, X 0.25. Photo by J. R. Brown.

Nothoscordum inodorum (syn. *N. fragrans*). This plant makes a handsome and bold clump, blooming in late August and September when flowers are scarce. The scapes rise to 24 inches and carry flat clusters of pure white flowers. Another plant much like it in appearance and named *A. odorum* flowers in July. They both self sow readily but if the plants are cut over after flowering there is little difficulty in controlling them.

BRUNSVIGIA SLATERIANA AND OTHER SPECIES

L. S. HANNIBAL, *California*

Through the courtesy of Mr. J. R. Brown we have obtained the following information on *Brunsvigia slateriana*. The bulbs, which are only three or four inches in diameter, can readily be moved during the early Summer without impairing their flowering capacity. Fine showy, red blossoms appear in late fall and are indeed very lovely (See Fig. 111). Usually the leaves follow the flowers, but when no flower bud appears they often begin development much earlier than normal for the season. The foliage is a bright glaucous green and very undulate. Apparently seedling bulbs bloom in six or seven years from planting.

Brunsvigias are extremely rare in U. S. A., and at present are nearly unobtainable. Several parties have seedling *B. orientalis* (Linn.), (syn. *B. gigantea* Heist.), the Candelabra Lily, and similarly a few have *B. gigantea* (Van Marum) Traub, (syn. *B. Josephinae* Redóute). The flowers of these two species are bright red, but the leaves of the latter are of a glaucous, lorate type while in *B. orientalis* they are broad and lingulate. *Brunsvigia Cooperi*, a high mountain type resembles a small *B. gigantea*, is fall flowering, and has an umbel of pink blossoms. *Brunsvigia rosea* is discussed elsewhere in this issue.

HAEMANTHUS ALBIFLOS

L. S. HANNIBAL, *California*

This plant resembles *Haemanthus coccineus* somewhat in growth habit. The bulb is greenish in color, flattened, and about 1½ inches in diameter. The flower scape develops in the late fall with a small compact umbel of white blossoms. In general appearance the bloom resembles a small white dish mop. The leaves, which are contemporary with the flowers, seldom grow more than 8 inches long by 2 inches wide. Like *H. coccineus* they are without pedicels. Fine white hair covers the whole leaf area, especially on the under side. The bulbs are easily grown and produce numerous offsets. A light moist humus is required since they are strictly a shade plant—in fact, so sensitive is *H. albiflos* to sunlight that the flower scape may slowly twist out of focus if the plant is placed in the full sun to have its picture taken.

The illustration, Figure 112, is reproduced from a photograph furnished by Mr. J. R. Brown.

HEMEROCALLIS IN AN IRIS GARDEN

HUBERT A. FISCHER, *Chicago, Illinois*

For over twenty-five years our chief interest in gardening has been growing iris, during which time hundreds of varieties have passed in review. With a keen interest in a plant genus the natural sequence is hybridizing and growing seedlings. This started many years ago, and in the course of years thousands of seedlings have seen the light of day simply because of a hobby in an amateur garden. Occasionally a few were held over, only to be discarded in later years.

Limited in size as a suburban garden naturally would be, the lack of adequate space has always been a major problem. The sunniest portion was set aside as the iris garden proper, and for years this was held inviolate from the encroaching plant members of other families. Later I was horrified at a suggestion from my wife that we plant a few *hemerocallis* into this iris sanctorum, and at first I firmly resisted the idea.

The credit for our early interest in *Hemerocallis* must go to her, for, being especially fond of yellow tints in the garden, she recognized their value. Each year a few new varieties found their way into the garden and gradually spread through the perennial borders until today there are probably about one hundred and fifty varieties.

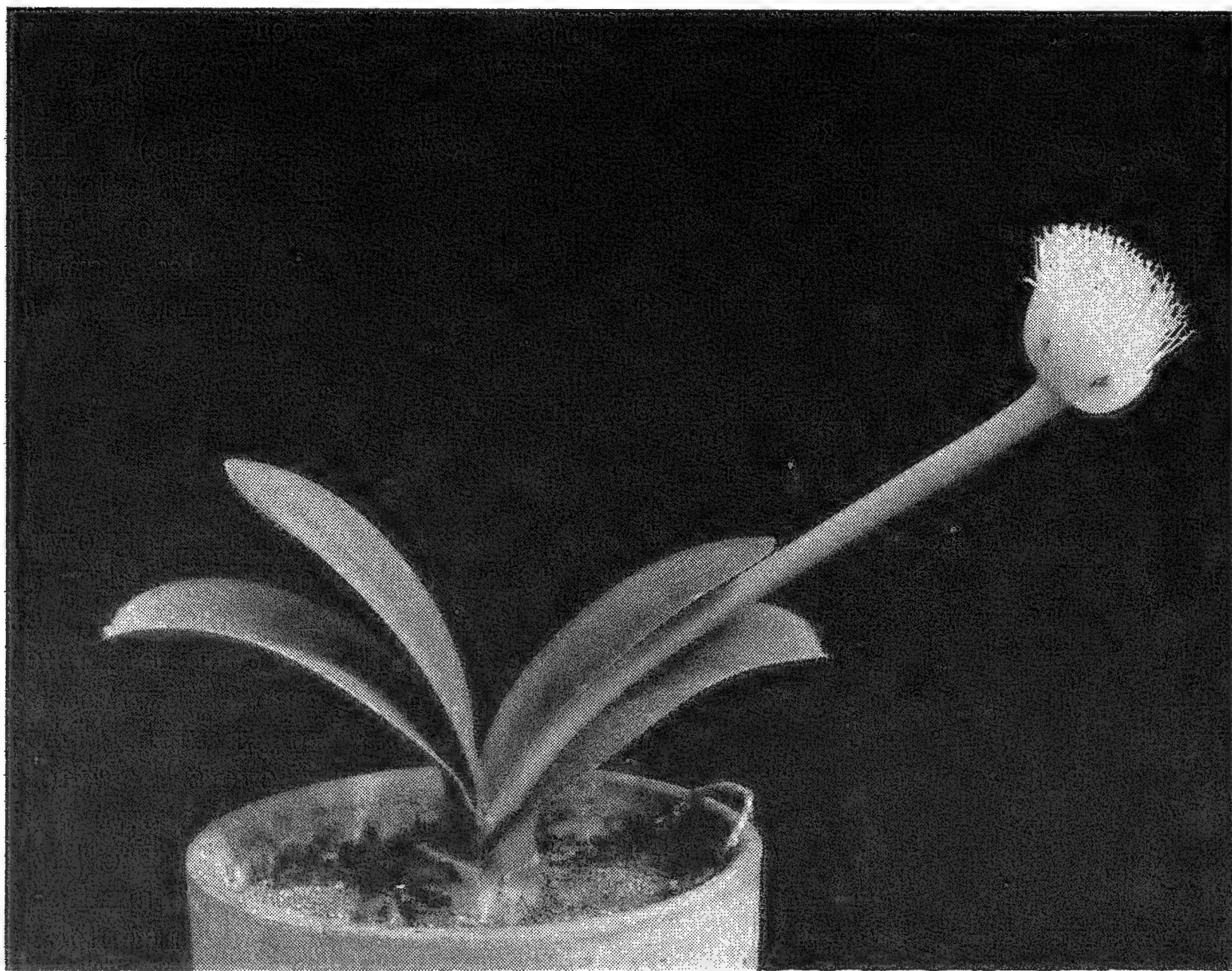


Fig. 112. *Haemanthus albiflos*. Photo by J. R. Brown.

I do not wish to create the impression that I had been indifferent to *hemerocallis*, I have always been very fond of them. My earliest recollection of this genus dates back to my childhood days, when once on a visit to the country I saw a huge patch of *Fulva Europa* growing under a tree, spilling down into the drainage ditch and up again to the edge of the dusty road—a wanderer by nature and loath to stay put. Being a city bred youngster, where picking of flowers was seldom allowed, I was amazed to learn that they belonged to no one, were growing wild, and that I could pick some of them should I care to.

My next acquaintance came years later when a friendly gardener gave us a clump of Lemon Lilies (*H. flava*). These were separated and

planted in the perennial border. The bright yellow worked in so well with the groups of iris and other plants that subsequent years saw this group multiplied into a dozen different places. Later we acquired a few plants of *Dr. Regel* and about twenty years ago we purchased *Calypso* and *Ophir*.

Today many varieties are planted throughout the borders and the corners of the iris beds have been given over to them. At first only sorts that bloomed with the iris were moved in. *Earliana* and *Auriole* are gay when the iris bloom, and *Apricot* is lovely with a planting of the iris, *Blue Triumph*. Other varieties come into bloom as the iris reach their peak. *Gloriana* bloomed very early this year, and then sent up a second group of stalks, giving us a season of six weeks of bloom. *Gayety* also bloomed with the iris this year and amazed us with fifty-four inch high stalks. The masses of large wide open primrose flowers dominated one corner of the garden, and a large clump of *Cressida* rivaled the sunlight with its vibrant color.

The close of the iris season has always left a rather empty feeling for there was really no bloom to look forward to in this part of the garden until another year. The gay colors and dancing flowers are gone and the sweet perfume on the gentle evening breeze is only a memory.

Today the picture is changed. Since the *Hemerocallis* have been moved into the iris garden, the color goes merrily on—the season is coming into its own with new varieties opening their first flowers daily. In the south border of shrubs and perennials *Highboy* nods in the breeze well above surrounding plants. *Maculata* holds its own with various tall plants and in one corner *Margaret Perry* is given ample space for her restless feet to ramble at will. *Moonbeam* with its soft coloring is lovely in the twilight. We like the night bloomers. *Hyperion* planted against a backstop of lavender phlox is a picture we wait for each year, and when *Hesperus* comes into bloom, I am sure it is my favorite. We like *Sachem* for its bright color—lovely *Antoinette* with its brown overlay. *Purple and Gold* has unusual richness of color and the large brilliant flowers of *Mrs. J. J. Tiggert* for the imposing group it makes. There are far too many to name.

At the west end of the garden where the iris seedlings beds are located is one section where the sunlight is partly filtered by the out-reaching branches of some apple trees and it is here that the *Hemerocallis* seedlings are planted. No plantings, big by the acre of thousands here—just a few hundred each year.

In all the pleasure of gardening there is none to compare with that of hybridizing and growing seedlings. The anticipation of seeing a new flower and knowing that you are the first to see it, and the thrill when an occasional plant shows merit, must be experienced to be understood. The impatience with which a promising flower is awaited usually results in just a wee bit of help for a pre-view. At this time of the year, the early morning visit to the garden—cool and moist with dew—usually favors the seedling beds first. Unfortunate the gardener who must leave for the city on these mornings.

I find that the growing popularity of the *Hemerocallis* is bringing about much the same condition as occurred with the iris many years ago. Too many varieties are being offered. Many introductions at high prices do not have sufficient merit or distinction, and in many cases descriptions are very confusing.

After reading a glowing and rather intriguing description which promises visions of a lovely pink, something on the order of a faded *Fulva Europa* is the actuality. In 1942 HERBERTIA an article by Robt. Schreiner pleads for a more simple classification with which I agree and I am certain most gardeners do also. It is desirable also to have a little more discrimination in the selection of new varieties—for I can grow mediocre seedlings myself.

We have become very fond of hemerocallis for several reasons. We love them for their bright colors—and for the various forms of flowers—the trumpet shape of *Ophir*, the full broad petalled flowers of *Dauntless*, the open flowers of *Hesperus*, the looseness of *Gayety*, the pinched and twisted petals of *Wau-Bun* and all the intermediate forms.

We like them for their freedom of bloom and their adaptability to location; their vigor and freedom from diseases. We like them because they give flowers here at a time of the year when there is a decided lack of other bloom in the garden. These features are important in the small garden where time and space are at a premium.

These lovely intruders have gradually worked their way into our iris garden and into our hearts through sheer merit. It is difficult to picture the garden without them.

DAYLILIES IN KANSAS

DARRELL S. CRAWFORD, *Kansas*

The search for ironclad perennials that stand our severe winters of sudden changes without protection, and our searing high wind's drought of summer, brought to light, among others, the dependable daylilies, *Hemerocallis*.

Many daylily clones are evergreen all winter without benefit of a mulch. As a rule, we, in Kansas, give no mulch or other winter protection. We do not have time to bother with clones that can not survive untended. Beginners and busy amateurs usually do not have time and money to waste on short lived clones. Our garden is on a northwest hill slope. The water drains off rapidly and the hill is swept by winter blizzards and summer blasts—"blows" lasting for two to three weeks. We must not forget that the Indian meaning of the name, Kansas, is "Land of the South Wind."

The gardeners in this area, as a rule, are not acquainted with such well known clones as *Ophir*, *Cressida*, etc., and grow only *Hemerocallis fulva* and *H. flava*. Most of them do not realize the enjoyment that is in store for them in the newer "reds" and "purples."

Vulcan attracts visitors who are fascinated by its deep maroon-mahogany-like blooms with golden cup.

Hankow is a giant with 6½ to 7" blooms. Visitors as a rule prefer it next to *Vulcan*. It gives the impression of a salmon-scarlet star with petals boldly outstanding like the three-bladed propellers of a bomber. A vigorous, heavy plant, scapes up to 42".

Dawn satisfies beginners for the change it represents from usual yellows. It has dull brick-red petals and brighter sepals. Segments are narrow and it tends to fade in the late afternoon.

The gracefully blended rosy star of *Fulva Rosea* is a favorite, but it may be a disappointment to some amateurs who expect too much from the fancy "build-up" in catalogs.

Peachblow seems too dainty and delicate for our climate in summer. Plants are small, dwarf. Blooms are pastel pink, a hazy rose-orange with coral eye-zone.

Lady Hesketh will never be popular here for it closes too early on hot summer days—by 10 a. m.

More clones like *Dauntless* with thick, heavy, heat resistant segments are needed for our Mid-West. It is ruffled and scented, creamy yellow, with a hazy bronze band.

Hyperion is of a heavy texture that resists our winds—a large refreshing, clear lemon yellow.

Nebraska (Sass) ranks with the best of the tall types. It can stand the abuse of wind and sun. The blooms are ruffled, tubular, 6", solid, rich cadmium-yellow. The mid-rib is palest pink with a suggestion of pink at tips. Over all the golden yellow, near orange, glows like the sunrise.

Golden West (Sass) produces giant tubular blooms that sparkle with gold dust. It is scented and remains open until midnight.

Hesperus (Sass) is another first class yellow.

Sunny West (Sass) produces open, star-shaped, pale yellow blooms of fine leathery texture; sun resistant, excellent for cutting.

White Lady (Sass) is a step nearer to white; a very pale creamy whitish yellow; scapes to 40" tall; July-August. Here it is a shade whiter than Mr. Sass' *Moonbeam*, which is a wonderful pale yellow giant. *White Lady* is popular with gardeners who do not care for bright tones. The roots are creamy, nearly white, unlike any others. It makes sturdy, heavy plants typical of Sass' hybrids, and is a persistent bloomer. We set plants of it in June which flowered three weeks later.

Starlight (Nesmith) is too fragile here. It burns and curls up quickly in the sun.

For early bloom the new *Judge Orr* promises to beat *Earliana*. It is a soft orange, medium size, late April.

Crown of Gold (Nesmith) is happy here. It is a wonderful ruffled, golden orange bloom, in late May. Gold dust is so heavily overcast that many touch it to see if it might rub off.

Linda wins everyone's heart with her creamy sepals and buff creamy petals warmed by a deep rosy brown eye; early June.

J. S. Gaynor attracts and deserves much attention. It appears like a 6" dove fluttering in the breeze. It is scented; orange-apricot without marks; late June to July.

Stalwart is a blend of bronze-gold. Petals are ruffled with red-bronze eye blended to yellow throat. Sepals are recurved, and petals are upturned like the ears of an alert puppy.

Enchantress is liked for its shy, half open tubular blossoms. Petals are faintly pink with brushings of bronze in the eye zone on creamy lemon.

Mikado and *Imperator* are reliable, and are recurrent bloomers, often blooming for the third time in October with *August Pioneer*.

Amaryllis and *Golden Dream* are similar to their soft, yellow blooms. They encourage beginners to try other and newer clones. Of the other older clones grown here, over 100 clones, many are so well known that we will not mention them at this time.

Olivia, *Halliana* and *Green Light* of Mrs. Popor are good but there is nothing unusual, except *Olivia*, a large 5½" orange-yellow. The petals are ruffled, broad, and tinted pink with lavender eye-zone.

Hybridizers should pay some attention to the requirements of the Mid-Western climate. Mr. Sass has made a good start that should encourage others to experiment along similar lines.

DAYLILIES IN SOUTHERN CALIFORNIA, 1943

C. S. MILLIKEN, *California*

The writer is contributing a few notes on the performance of some of the comparatively new daylilies which he has observed here in Southern California this year, and with these newer ones includes a few which are not so new but which in his opinion are still in the top class. There are many others which he is either growing or which he has seen rather casually elsewhere but which for one reason or another he will leave for another time. The list is arranged alphabetically.

Afterglow (Stout) is one of our favorites. Its soft coloring is unmatched by any other variety which we have seen. *Caballero* (Stout) and *Carnival* (Traub) are both splendid bi-colors, the former the brighter, the latter the deeper; vigorous plants; large flowers (6 inches).

Dominion (Stout) is a rich red that needs partial shade here and it fades in bright sunlight. The very broad segments and soft coloring of *Duchess of Windsor* (Traub) place it among the finest. *E. W. Yandre* (Hayward) is also one of the finest. The coloring is pleasing and the very flat form exceptional. We like it very much.

George Kelso (Traub) seems to us to be one of Dr. Traub's best. The soft coloring and the crisped segments contribute to its pleasing effect. *Golden West* (Sass), we think, possesses many of the desirable characteristics of a superior daylily. *Hesperus* (Sass) is very large and impressive. *Jubilee* (Stout) is one of the best of the banded daylilies; the coloring is clear, size, shape and carriage pleasing. The bright color and large spreading flowers of *Mrs. J. J. Tigert* (Watkins) have made this very popular with our friends. *Patricia* (Stout) is not new, but always a joy. Certainly one of the very finest. *Port* (Stout) has small flowers but they are bright and interesting.

Red Bird (Stout) is very bright. There is some question, perhaps, regarding the vigor of the plant. *Rosalind* (Stout selection) does well and will be generally liked. *Rosy Day* (Nies) is attractive and a wonderful performer. *Ruby Supreme* (Wheeler) is a prize winner if there ever was one. It is outstanding. For a rich dark red *Sachen* (Stout) is destined to become standard because of its fine uniform color for it fades but little even in our hottest sun.

Star of Gold (Sass) is a large flower, earlier and lighter yellow than *Hesperus*, equally tall; its evergreen foliage is in its favor in California. *Sweetbrier* (Nesmith) is a very fine large flowered rosy-pink and a vigorous plant. It is destined to be very popular. *Theon* (Stout) is certainly a very deep red-purple which holds its color well. *Triumph* (Stout) is at the top of the orange colored daylilies which we have seen here. We like the bright color and the pleasing shape of *Vulcan* (Stout).

DAYLILIES IN NORTH CENTRAL TEXAS

MISS W. M. KELL, *Texas*

The size and strength of clones from different originators varies greatly. Many of newer clones that are recommended for planting in shade do not respond in dry shade. However, if planted in rich, moist soil and left until well established, they will perform satisfactorily.

Many of the newer clones may be useful for hybridizing but are of little use in amateur gardens. Many are still confused in the trade as to the true name. One often secures plants with two different clones in the same clump. However, the progress in producing new daylilies of garden value is of great value to Mid-West gardeners. The American Amaryllis Society is to be congratulated in sponsoring the rigid evaluation of daylilies. This is a real service that all will appreciate.

Below, the writer lists the clones that have flowered in her garden. These are grouped under two headings:

(1) *Clones flowered for two seasons: Antoinette* (Hayward), evergreen, strong growing; a choice flower, height above average; 1st. bloom May 26, 1941; 1st bloom May 16, 1942. *Duchess of Windsor* (Traub), evergreen, strong growing, choice flower, height above average, 1st. bloom June 20, 1941; 1st. bloom June 7, 1942. *Chengtu*, evergreen, strong growing, flower small but a new color; valuable for breeding; rapid spreading by stolons is objectionable; 1st. bloom July 1, 1941; 1st. bloom June 23, 1942. *Florida* (Hayward), partly deciduous, medium grower, flower small, low height. 1st. bloom June 13, 1941; 1st. bloom July 2, 1942. *Granada* (Traub), evergreen, strong grower, choice flower, height above average. 1st. bloom June 1, 1941; 1st. bloom May 31, 1942. *Hesperus* (Sass), deciduous, medium grower, good yellow, larger and more irregular than *Patricia*; height above average. 1st. bloom July 2, 1941; 1st. bloom June 25, 1942. *Golden West* (Sass), evergreen, strong grower, choice yellow, very tall. 1st. bloom June 6, 1941; 1st. bloom June 2, 1942. *Ralph Wheeler* (Hayward), evergreen, medium grower, choice flower, 1st. bloom June 20, 1941; 1st. bloom June 6, 1942. *Vulcan*

(Stout), evergreen, good grower, flower like red velvet. 1st. bloom June 26, 1941; 1st. bloom June 27, 1942.

(2) *Clones flowered for one season.* *Mildred Orpet* (Traub), deciduous, slow growing, flower has three pastel pink segments, and three soft pastel yellow. 1st. bloom June 7, 1942. *Multiflora Luna*; deciduous, slow grower; flowers small; height low. 1st. bloom June 6, 1942. *Indian Chief* (Traub), evergreen, good grower, choice flower. 1st. bloom June 25, 1942. *Marcelle* (Hayward), partly deciduous, medium grower, choice flower; very large. 1st. bloom June 2, 1942. *Princess* (Stout), evergreen, medium grower, good yellow. 1st. bloom June 25, 1942. *Rosita* (Hayward), bloomed June 18, 1941, but died in July, 1942. *Victory Taierhchwang* (Traub), evergreen, medium grower, choice flower. 1st. bloom June 25, 1942.

CONCERNING INJURY TO DAYLILIES BY THRIPS

A. B. STOUT, *The New York Botanical Garden*

A report on the injuries to daylilies by thrips was made by the writer in 1940.* In each of the three summers since then there has been considerable of these injuries in the collection of daylilies at The New York Botanical Garden. Some of the observations on these injuries may now be recorded.

The first noticeable signs of this injury were observed during early summer in scapes that were then ready to flower. Thus it seems that the species and horticultural clones which flower first in spring escape injury. But this condition may be due to the normal period of infestation rather than to any inherent immunity of the early flowering daylilies to the attacks of thrips.

For several years the effects of infestation by thrips have been most severe and complete to plants of *Hemerocallis citrina*. The plants of this species in the collection include ramets of the clone first introduced into culture in Italy and seedlings of seed recently collected of wild plants in the Orient. All of these plants have been so severely injured that from 1940 to 1943 inclusive few if any uninjured scapes were produced during the normal period of flowering in July and early August. The accompanying illustration (Fig. 113) of a photograph obtained in 1940 shows the range of the injuries which were observed. At the left is shown a scape with the entire inflorescence undeveloped, shrivelled, and dead. In cases of most severe thrip injury many or even all of the scapes on a plant may be in this condition. At the extreme right is shown a scape which had several almost perfect flowers but the greater number of flower buds had been destroyed. In such scapes the flowers which mature are, as a rule, the more terminal ones of the primary inflorescence which develop first. The injury is often complete to entire laterals below the primary inflorescence and to those within it. These conditions indicate that the thrips feed on the more tender and least developed parts of the scapes. In cases of slight injury there are usually only vertical strips along the stem immediately above the bracts

* Journal of The New York Botanical Garden 41: 244-245.

that are rough and brown in color and composed of several layers of dead and apparently corky cells.

Plants of the species *H. fulva* which bloom in midsummer have differed greatly in the degree of injury by thrips. No appreciable injury has been observed thus far to ramets of the *H. fulva* clone *Europa*, some of which have stood close to plants of *H. citrina*; but other members of this species have been severely injured.



Fig. 113. Scapes of plants of *Hemerocallis citrina* which show stages of injuries resulting from feeding of thrips. Photo New York Botanical Garden.

During some years, and especially in 1942, nearly all plants of *H. Thunbergii* suffered severely from thrip injury, but the extent and amount of such injury to these plants has varied from year to year, especially for the members of this species that are latest to bloom.

During 1942 nearly all plants of *H. multiflora* showed much injury by thrips but in 1943 many of the same plants had little injury and flowered with profusion. Most plants of this species begin to bloom during August and the extent of the thrip injury to them has varied greatly from year to year.

It may be reported that various hybrid progenies which have in their ancestry one or more of the species *H. citrina*, *H. Thunbergii* and *H. multiflora* have, at least in some years, been much injured by thrips, and these hybrids include some of the named clones of which mention may be made of *Summer Multiflora Hybrids*, *August Pioneer*, and *Boutonniere*.

It should be mentioned that the foliage of many plants that have severe injury to their scapes and flowers remains apparently in good condition. Especially is this true of plants of *H. citrina*, *H. multiflora* and *H. Thunbergii*. Possibly close examination may reveal that the thrips do feed on leaves, and it may be that there is injury to the leaves of members of the *H. fulva* group which become rusty brown in summer.

It is possible and perhaps probable that the decay and death of foliage and buds in the crown rots observed in summer and autumn are due to a fungous or bacterial pathogen quite independently of thrip injuries. Also these appear to be quite distinct for the winter injuries which develop as crown rots in early spring.

During the time when the maximum injuries by thrips are evident in the collection of daylilies there are always numerous plants which are in excellent flowering and on whose scapes there are few or even no signs of thrip feeding. Whether such plants are immune to the feeding of thrips or have merely escaped infestation is not now evident.

At New York the extent of thrip injuries has definitely decreased as autumn advances. In 1943 no injury was observed on the numerous plants of the late-flowering species *H. altissima* or on many of the several late-flowering hybrids grown when such species as *H. Thunbergii*, *H. multiflora*, and *H. citrina* are bred with *H. altissima*. The amount of injury seemed to be much less on late flowering plants of *H. Thunbergii* which came to The New York Botanical Garden from northern Japan than it was on the members of this species which bloom earlier.

The conditions shown in Figure 114 may be explained in this connection. The photograph was taken on August 31, 1943. At the left are plants of *H. citrina* which flowered during July. Scarcely a flower had developed but the foliage remained in splendid condition. Close by to the right is a plant of *Autumn Prince* showing some of the first flowers of its period of bloom which continued until late in October. On these plants there were only a few signs of thrip injuries and these were limited to a few of the lower internodes of the inflorescences. The clone *Autumn Prince* is the propagation of a seedling selected from hybrids of *H. altissima* x *H. Thunbergii*.

In 1940 a collection of thrips was captured on the inflorescences of injured daylilies at The New York Botanical Garden and sent to Professor J. Douglas Hood of the Department of Entomology, Cornell University. His statements regarding these thrips are quoted in the

report mentioned in the beginning of this article. Four species were identified by Professor Hood but he decided that one species, *Frankliniella tritici*, is responsible for the injuries to daylilies. It is of special concern to note that this species is “*abundant throughout all of eastern North America*” and that it is “*present from spring to fall.*”

There has, I believe, been no mention of thrip injuries in any of the numerous articles on daylilies that have been published in the volumes of HERBERTIA. Professor E. J. Kraus of Chicago University has stated in a letter to the writer that there has been considerable thrip injury in the collection of daylilies being grown under his supervision at Geneva, Wisconsin.

It is probable that thrip injuries to daylilies may now occur or later develop somewhat widely in eastern United States. In any case



Fig. 114. Left, *Hemerocallis citrina* plants that flowered in July, thrips injury so severe that few flowers developed, foliage in excellent condition; right, plants of late-flowering Autumn Prince, scapes show mere traces of feeding by thrips. Photo New York Botanical Garden Aug. 31, 1943.

various aspects of the matter now merit some attention. At the present time information may be reported and assembled on the geographic range of the injuries and their severity in different areas. Attention may well be given to the identification of the one or more species of thrips that are involved. It will be important to learn the facts regarding the life cycle of these thrips in respect to their multiplication, feeding habits, and possible migration from other plants to daylilies. Such information will have a very direct bearing on the evaluation of daylilies which are immune or which escape infestation. Another matter that may become of concern is that of effective methods of reducing infestation by the use of dusts or sprays of rotenone, pyrethrum and tartar emetic.

DAYLILY RESPONSE TO LOW TEMPERATURE

J. MARION SHULL, *Maryland*

For the first time in many years of experience with *Hemerocallis* it has been possible to make notes on their behavior under continued abnormally low temperature.

First, a resumé of the weather for the period involved. June, 1943 had broken all records for excessive heat, some 16 days or more of unbroken daily maxima in the 90's, then following a light rain, the last day of the month was ushered in at the relatively low temperature of 64° and failed to rise above 70 all day. The morning of July 1 came in at 54 and did not rise above 70. July 2 likewise began at 54 with a maximum of 74, and on July 3 the corresponding figures were 58 and 76. On the 4th of July morning temperature was again at 64, with an evening temperature of 75.

The reaction to these five days of extremely low temperatures for the time of year, was pronounced and various. All growth was slowed. Development of buds was delayed so that volume of bloom fell off progressively from day to day, and slower growth of buds ready to bloom resulted in smaller flowers. But the most startling reaction was in the realm of color. In general, all brilliant colors were dulled, all dark colors very much lightened, while on the contrary some delicate colors were darkened.

More specifically, such clones as *San Juan* and *Vulcan* lost all their luster and nearly half their depth of color. Dr. Traub's *Dr. Stout*, that normally presents a rich orange yellow brightly overlaid with red, and with nearly solid red sepals, lost all its red overlay and became a simple orange yellow. *Mikado*'s rich red eye spot was reduced to a distal half moon with the light throat correspondingly enlarged. *Iris Perry*, normally acceptable as a smooth orange, the eye barely perceptible, was splotchily darkened with dull red and displayed a pronounced dirty red eye. Similarly, orange and yellow seedlings descended from *Iris Perry* as one of the grand-parents, showed pink flushing not previously seen in them.

Similarly darkened was a lovely seedling of my own, with enchanting pale iridescent flesh tones under normal conditions. Under the influence of cold it came with an overlay of dirty pink that completely spoiled its charm—was about three times darker than it should be.

By July 4th slowly rising temperature had restored some of the brilliance but not yet the depth of color. By the 5th they were good again but not until the 6th, with maximum temperatures going above 80 was the full richness and brilliance again attained. Size of flower had also returned despite a definite lack of rain, suggesting that active growing temperature at night, or as buds are approaching the time of actual flowering, is probably a leading factor in the determination of ultimate size. Size is of course largely varietal but any one long familiar with a daylily garden has noted that size also fluctuates from day to day in the same varieties, and without any very apparent reason.

WINTER INJURY TO DAYLILIES

J. S. COOLEY, *Senior Pathologist,**U. S. Plant Industry Station, Beltsville, Maryland*

The winter of 1942-43 was unusually severe on daylilies growing in the vicinity of Washington, D. C. A description of the injuries sustained may be useful in diagnosing the diseases and environmental disturbances of this group of plants. Some observations of the writer on winter injury and transplanting were published in *Herbertia*, Volume 8*. Injury from cold may be considered as of two more or less distinct kinds; (1) Frost injury, the manifestation of which is dead tips and margins of the young leaves; (2) Winter injury proper, in which the crown is affected by adverse winter weather to such an extent that it is killed or is so injured that it is unable to produce normal shoots during the growing season following the injury.

The injury to the tops which we are designating as frost injury was especially prevalent in the spring of 1943 when freezing weather prevailed after young shoots had started growth. Some varieties are much more susceptible to this type of injury than others. The dead margins and tips of the leaves give a tattered and disheveled appearance to the plants in early spring. In a short while however new leaves cover up the disfigured ones and the plants look normal and healthy.

Where there is winter injury to the crowns a more serious and lasting condition prevails than where the trouble is confined to frost injury of the leaves. Crown winter injury may be manifest by stunted shoots, by spindling shoots, and by the death of the whole crown. In the stunt type of injury the shoots show short twisted, crinkled, abnormal leaves which give a dwarfed or stunted effect. The affected shoots seldom produce bloom scapes the summer following the injury, and the few that are produced are short and appear abnormal. The general appearance of the abnormal plant suggests effects of severe attack by an active pathogen (Plate 252).

The spindling shoot type of winter injury to the crown is well described by the name. Instead of one or more heavy, vigorous shoots, the plant produces a number of weak, spindling shoots. In severe cases an affected clump resembles a clump of grass. Plants affected with this type of injury likewise do not bloom until they recover enough to produce normal shoots. This spindling shoot type of winter injury is especially prevalent in certain varieties.

Both the stunted and the spindling sprout types of winter injury have been under observation for several years and it has been ascertained that recovery may be complete from each type. The fact that plants thus injured have completely recovered by the second or third summer after the injury and then perform normally again is good evidence that the trouble is not due to a virus even though some of the symptoms might suggest such causation. Usually those varieties that are susceptible to winter injury of the crown are also affected by the frost type of injury to the foliage.

* Some experiences in daylily propagation. *Herbertia* 8:121-122, 1941.



Hybrid daylily seedlings: left, stunted plant resulting from winter injury in crown; right, normal shoot not injured at crown arising from the same clump.

Another aspect of winter injury that has caused some of us much loss is the injury to newly transplanted plants or to plants that were too small at the advent of cold to withstand the adversity of winter weather. Sometimes such plants are killed outright; at other times they are affected by one of the manifestations of winter injury described above. Much of this type of injury is preventable. The prevalent idea that daylilies may be divided and transplanted at any time needs to be modified. The question then arises as to what is the proper time to transplant daylilies so as to have the minimum of casualties from winter injury. If transplanting is done at a time when there is relatively little root activity one would expect the least shock to the plant. It is also well established that many plants when newly transplanted will be affected by winter injury while well established plants are unaffected; also a small weak plant transplanted even in mid summer may succumb as a result of winter injury. When transplanting is done too late in the fall for the plant to become well established before cold weather even strong plants may die as a result of winter injury. Repeated observation of the root development at various times during the growing season indicates that there is a cessation in root activity about the time blooming is over, followed by a period of rapid root development in the early fall. The root development of established plants continues well into the winter whenever the soil is warm enough and aeration favorable for growth to take place. This post bloom period of lessened root activity, prior to the resumption of rapid root development, would seem to be the proper time to transplant. The practical experience of the writer has confirmed his theoretical deductions in that more satisfactory results were obtained from transplanting just after blooming was over than at any other time. The most satisfactory time to divide and transplant the late blooming varieties of the multiflora type has not been determined by the writer. It may be that early spring would be a more satisfactory time for transplanting these varieties than after blooming since this would be too late for much root growth to take place that fall.

The practical question arises as to whether or not anything can be done about winter injury to daylilies. We cannot modify the temperature, but certain procedures may modify growing conditions to such an extent as to prevent or lessen the injury due to winter weather. The observation has been repeatedly made that winter injury to the crowns is most severe where the soil is excessively moist. In some cases plants growing in a slight depression had every shoot deformed whereas the same variety growing nearby on slightly higher ground had very few abnormal shoots. It follows therefore that conditions can often be made less favorable for winter injury by bedding up the row or the area where the plants are to be set 5 or 6 inches above the general level, particularly if the soil is retentive of moisture. Transplant in mid-summer or early fall rather than in late fall or winter. Even the wounding or disturbance produced by digging off part of a clump in early winter has caused serious winter injury to the whole clump. Where small plants result from splitting the shoots, it is safer to grow them in a greenhouse or cold frame for the first winter than to expect them to withstand outside conditions.

NOTES ON BOMAREAS, 1943

W. M. JAMES, *California*

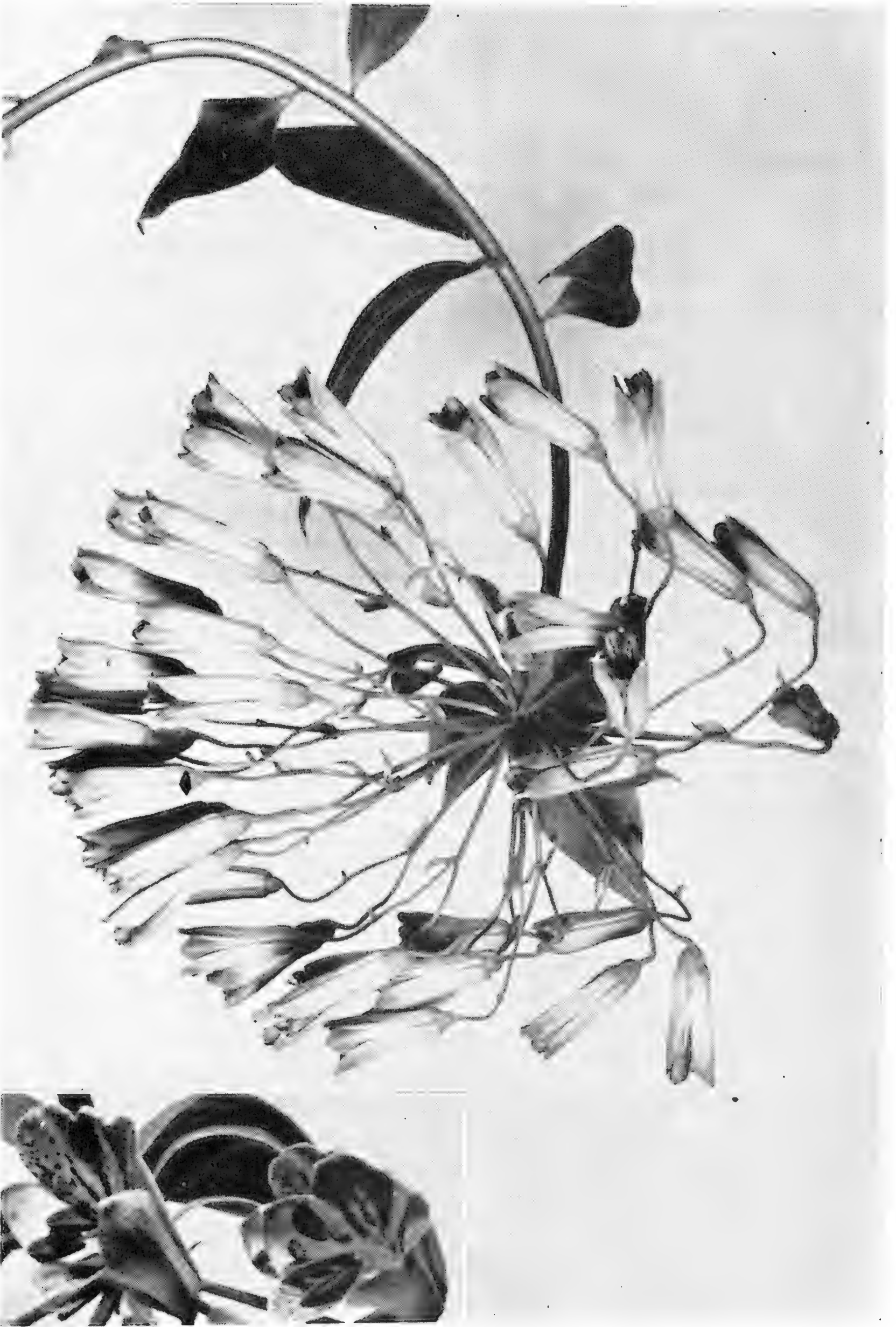
Bomarea edulis. The flowers are almost tubular and average three-fourths inch in diameter and one and one-eighth inches in length, including the ovary. The color is a combination of pale coral and green; the outer segments of the flower being pale coral outside and white inside tipped with green on both sides, and both sides of the inner seg-



Fig. 115. *Bomarea Lehmanii*, flowers and fruits. Photo by W. M. James.

ments are the same color green as the leaves with short purple stripes on the inside. The anthers are greenish blue and the pollen purple. (See Plate 253).

The tubers are distinctive as compared to any others I have seen. Instead of being long, slender and easily broken when dug or divided, *B. edulis* tubers are short and thick—almost egg-shaped—and dig very easily.



Bonmaria edulis, inflorescence about six inches in diameter, in natural position; in right corner, flowers slightly larger than natural size to show spots inside flower. Photos by W. M. James.

Bomarea Lehmannii. The flowers are about the same shape as *B. edulis*. They average one-half inch in diameter and one and one-fourth inches long. The color is a brick red outside (not very bright) and orange inside, with dark red spots inside. The anthers and pollen are dark blue and the seeds are a brilliant orange scarlet. (See Figure 115).

These pictures are of flowers taken from plants received from the U. S. D. A. several years ago by Las Positas Nursery. The color descriptions are my own and might not correspond exactly with those of other people. I have noticed quite a variation in color sense. When compared with *B. Caldasiana* and *B. acutifolia*, the flowers of *B. edulis* and *B. Lehmannii* appear dull and not as showy. However, they are a big help in becoming acquainted with the genus.

THE ARBUCKEL HYBRID AMARYLLIS

GEORGE W. ARBUCKEL, *New Jersey*

The writer is an amateur breeder of hybrid *Amaryllis* and has been active in this field for some years. He has now close to 250,000 bulbs of Giant New Jersey hybrids, the bulbs ranging from small to very large.



Fig. 116. Arbuckel Hybrid *Amaryllis*; Miss Arbuckel in background.

These were all grown from seeds secured as a result of hand pollination. The size of the flowers can be judged from Fig. 116 that shows some of these hybrids. All of the bulbs were grown as a hobby here in the North.

The important point to bear in mind is that these have been grown in the North with only a four months' growing season as compared with at least double this period for growth in the South. These results should encourage others in the North to try hybrid *Amaryllis* as a hobby. If a sufficient number of northern amateurs could be enlisted, then there would be the stimulus of a friendly rivalry that would accelerate progress in this field. So far the southern *Amaryllis* breeders have had hardly any competition. Other reports on the writer's results with hybrid *Amaryllis* will appear in future issues of HERBERTIA.

AMARYLLIDS ON WREATH

In the August 20, 1942, Florists' Review, pages 23-24, appears an excellent illustration of the use of an amaryllid as a cluster on a large gladiolus wreath. The explanatory note follows: "A cluster of pink amaryllises [*Brunscrinum Howardii*, syn. *Amarcrinum Howardii*] now seasonable novelty flowers on most larger wholesale markets, can be used to splendid effect on a large wreath. * * * Here the wreath is made solid of gladiolus florets, pink, lavender or white being appropriate with the cluster flowers. An innovation in the cluster is the use of the [gladiolus] stems cut from the flowers, wired and inserted as a separate unit to give a more artistic effect to the design. Huckleberry is used among the amaryllises."

THE BOBOLINK DAYLILY

R. W. WHEELER, *Florida*

The new Daylily, *Bobolink*, is a hybrid combining Purple and pale Gold Yellow in a striking bicolor. It flowered for the first time in 1943 at two years old. Its seed parent was the rosy red, strong growing, semi-bicolor *Elizabeth Wheeler*. The Purple of the petals of the *Bobolink* Daylily is between Pansy and Heliotrope of the Standard Color Card. The flower is compact, medium in size with wide, well open segments. The petaline-segments are creped and frilled. The flower scapes are 3½ feet tall, and do not lean. The plant is vigorous in growth, multi-flora in habit and in Florida it is evergreen and a recurrent bloomer. (See Figure 95).

6. SOCIETY'S PROGRESS *

THE SECRETARY'S MESSAGE

The 10th. Anniversary Edition of HERBERTIA comes forth as a tribute to your Society's continued determination to carry on at least a possible minimum of its activities in war time, and to the unflagging enthusiasm and inspiration of its editor, Dr. Hamilton P. Traub now with the United States Department of Agriculture at Salinas, Calif.

The year has seen changes in the Society, its incorporation in California, the resultant necessity for transfer of the active secretarial duties to that state, where the work has been undertaken by Mr. Lester S. Hannibal, a confirmed believer in the future and investigator of the past of our most interesting family of plants. Mr. Hannibal becomes executive secretary with this issue, and all matters of dues and advertising in HERBERTIA are being handled by him.

Your secretary has been virtually obliged to suspend horticultural operations for the last few months because of the absolute inability to obtain garden labor for this business, and has been engaged in journalism on the staff of an Orlando newspaper for more than a year. He hopes this situation is only temporary and that conditions will soon permit his return to full time occupation with his plants and bulbs at the end of the war.

Because of the press of outside affairs, the secretary fears he has been sadly remiss in the affairs of the office, and in assisting the editor in his yearbook preparations, but has honestly endeavored to spare every effort toward these purposes that it was possible to give. The Society has continued to grow. Its financial condition under war time emergencies has been favorable to date, and the accumulations of daily mail have been actually stupendous. Thanks are sincerely extended to all correspondents who have been most patient while realizing "there's a war on."

The Society cannot boast of its usual shows this past year. Nor has the ordinary visiting of members to each others gardens at blooming season been possible because of travel difficulties. Foreign mail has been extremely irregular or almost non-existent. This situation shows no sign of improvement, and the Society's operations seem headed for purely domestic boundaries, except for the help extended by our many British friends, as long as the war lasts. The kindness and interest of the contributors and all our many other friends has been heart-warming, and we appeal for their continued cooperation and charitable acceptance of the difficulties under which the Society continues to operate.

We move forward, bearing the torch of plant science and garden beauty. It is a noble effort and needs no apologies in the ugly days of

* The material in this section was prepared by Mr. Wyndham Hayward, Secretary, Mr. L. S. Hannibal, Executive Secretary, and Mr. W. M. James, Chairman of the Trial Collections Committee. We owe these gentlemen a debt of gratitude for their contributions toward the advancement of the amaryllids.—
Hamilton P. Traub.

world conflagration. As long as we can carry on the spark of hope for better things, there will be something to look forward to, in the days of peace again.

With every wish for your safety and well being, I send a greeting to all members in every land, and especially to the members now in the armed services.

*Winter Park, Florida,
December 22, 1943*

*Wyndham Hayward,
Secretary*

EXECUTIVE SECRETARY'S MESSAGE

The year of 1943 has been indeed a very busy one. Directly or indirectly war work has cut heavily into the time of both members and officers. Many of the members are connected with agricultural or horticultural pursuits, and the present "Food for Freedom" effort has diverted the attention of these members from flowers to the practical phases of food crops. Almost all report their gardens lie half attended, some even full of weeds, since help is unobtainable and time is so limited. These conditions are not normal, but serious as the problems of the "home front" appear we should not complain. Such are secondary to the chief objective of defeating the common enemies of civilization. We owe our freedom to those who are in the armed services of the United Nations. To our members so engaged we particularly send greetings and best wishes.

The influence of the war has been reflected in the Society and several adjustments have been made during the recent year. Somewhat unanticipated we have had a marked membership increase. Both Mr. Hayward, our secretary and Dr. Traub, our editor, are in positions that demand their full time. The many hours which they so generously devoted to the Society in the past are no longer so readily available. The increasing loads of correspondence have been a real problem. To lighten this burden the work has been redistributed. The American Amaryllis Society is now incorporated under the laws of the State of California.

A Narcissus Committee has been appointed. With the able assistance of the Committee we plan to build up the Narcissus fraternity to a degree comparable to the Daylily group. We already have a large number of Narcissus enthusiasts and breeders among our membership, but more are welcome. The Atlantic and West Coast are ideally adapted to Narcissus culture, and although most local breeders and amateurs have not progressed beyond the F-1 or F-2 stage, they already promise keen competition to our English, Irish and Australian friends.

HERBERTIA for 1944 will feature the Allium group. We would appreciate receiving contributions for publication particularly pertaining to this group both from the standpoint of ornamental flowers and as an agricultural product.

Importation of new plant material has been neglected for some time. The society wishes to call attention to the fact that there are many Amaryllids in South America and North Africa that we have

never seen in cultivation. We are particularly anxious to import new material and to obtain descriptions of some of these relatively unknown or obscure plants. To facilitate these matters the society has made arrangements with the United States Department of Agriculture to permit entry of research material. Those interested in cooperating are asked to contact this office.

Dr. Traub's time is essentially taken up with his research work at the Guayule rubber project, but his interest in amaryllids remains steadfast. On Sundays the first place to look for him is in the garden. The efforts he puts in as editor of the journal is long and painstaking, but it is well spent for it is reflected not only in our increasing membership but likewise by our standing in plant science circles.

On behalf of the Society the Secretary wishes to thank all who have contributed material for publication or advertising, or have assisted in the various branches of the organization. The present stress and inconveniences caused by the war will eventually pass. We appreciate and need your support for the coming year. The success of the organization depends upon the mutual services rendered between members and headquarters. May we ask your assistance in locating new members.

Concord, California,
November 15, 1943

L. S. Hannibal,
Executive Secretary

EXECUTIVE SECRETARY'S MAIL SACK

War, in spite of its tragedy, records some humorous occurrences. We quote from John Steinbeck's syndicated article which appeared Oct. 14, 1943 regarding the floral tributes thrown by enthusiastic Italian crowds to the American and English troops during their early conquest of Italy. "One of the most ridiculous and most dangerous occupations was the investment of the Island of Ischia. There the people casting about for some floral tribute found that the most promising and prominent thing available was the pink Amaryllis [= *Brunsvigia rosea*, Cape Belladonna]. Other material would have been more suitable, since in the hands of an enthusiastic Italian crowd these plants became almost a lethal weapon. A reasonable-sized bunch of these flowers with big thick scapes may weigh four pounds. In a short drive through the streets of the City of Ischia, some of the troops were nearly beaten to death with them, while one naval officer was knocked clear out of a car by a well aimed bouquet of these overly fragrant blossoms. His friends proposed him for a "Purple Heart" and wrote a report on his bravery in action: 'Under a deadly hail of Amaryllis [= *Brunsvigia rosea*] the Lieutenant Commander fought his way through the street, although badly wounded by this new and deadly secret weapon.' "

Miss K. C. Stanford in the Union of South Africa is attempting to collect a few of the *Brunsvigia* spp. for the society. She reports that both collectors in the field and paper cartons for shipping are hard to locate.

Our Editor, Dr. Traub, has had several interesting experiences with Daylilies on the Pacific Coast. The cool nights tend to wash the colors out of the reds, but he reports some of the lighter shades are superb, especially *Mildred Orpet*, *Duchess of Windsor*, *Waubun* and *Patricia*. This gives a new angle for breeders to work on: The stabilization of colors for those who live in the cooler areas of the U. S. A., which would be a great asset.

In the coffee room of the Santa Lucia Inn of Salinas, California, the writer noticed a number of excellent lithographs taken from the pages of prominent early botanical publications such as Redoute's "Les Liliacees." Inquiry as to the source of these prints was of no avail, but if anyone could tell us where similar prints could be found we would greatly appreciate it. The society eventually desires to build up a reference library and anything of this nature is highly desirable.

Mr. Fred M. Danks of Australia reports that several breeders there are still working with *Brunsvigia multiflora hybridum* and that they have developed wine and scarlet colored "Cape Belladonnas."

Jean Gattefosse of French Morocco writes that he is continuing his native *Narcissus* studies and that he is collecting material for the Arnold Arboretum.

Dr. T. H. Goodspeed of the Botanical Dept. at the Univ. of California at Berkeley has returned from an extended tour throughout South America. He sent several Amaryllids back to the Botanical Garden during his trip—one species of *Amaryllis* was reported as partly yellowish. This turned out to have less yellow than anticipated, but it is well worth mentioning since it belongs to the Aulicum group and keyes out to be near *Amaryllis Forgetii* (Worsley) T. & U. (HERBERTIA P. 54, 1939). A very short tube makes it of unusual interest. We hope to hear from Dr. Goodspeed regarding this find.

Cecil Houdyshel writes: "The fragrant *Amaryllis solandriiflora* hybrids have been grown for nearly 40 years, and probably much longer. In 1904 (or 1906) John Louis Childs mentioned *Solandriiflora* var. *conspicuum* in the Amaryllis number of the Mayflower Magazine. I tried to find a bulb for a number of years and finally bought one, which later turned out to be a hybrid. This was from the son of C. M. Hovey who had a Childs Nursery branch at Pasadena 35 years ago. About 1912 I remarked to Luther Burbank that the color, type, and fragrance of some of his hybrids showed *solandriiflora* in their ancestry. He had not previously heard of the species. Mr. Burbank is said to have obtained some stock from an early California breeder, Comparé, who apparently used *Solandriiflora* or *Solardriiflora* var. *conspicua* (commonly called *Ambiguum*) in his hybrids."

In looking up Nehrling's writings in his almost forgotten book "Die Amaryllis" we find that the firm of Haag and Schmidt imported in quantity a number of *Amaryllis solandriiflora* var. *conspicua* from Costa Rica in 1870. Nehrling received his bulbs in 1896 and produced

a number of hybrids, but as var. *conspicua* was known to Herbert in 1835 it is possible that some hybrids had very early origin. This beautiful strain has the distinction of being very fragrant, with a suggestion of bitter almond.

The society is very anxious to locate new plant material which is to be used for research and breeding purposes. Members outside of the U. S. A. are requested to contact the Executive Secretary at Concord, California, or Mr. W. M. James at Ojai, California, and plant import tags will be sent immediately.

Speaking of *Narcissus*, Frank Leach recently showed the writer a little volume entitled *Narcissus-Daffodils*, by A. M. Kirby, published in 1914. Under Tazettas he lists 34 all yellow varieties, 37 bi-colors, and 5 all whites. Apparently these were mostly available in Holland gardens, but a number had been imported into the U. S. A. What has become of this group? Like the Dinosaur has this become a nearly extinct race? Mr. Arno H. Bowers and the writer have located only 7 types. These are essentially all near whites. "Bazelman Major," "Gloriosus," "Grand Monarch," "Grand Primo," "Grand Primo Citronier," "Jaune Supreme," "Queen of the Yellows" and other popular forms of 30 years ago are apparently unobtainable. We realize that wars and severe winters have taken their toll, but it seems incredible that these plants could vanish so soon. It appears highly advisable that some action should be taken to locate and preserve what few specimens that may remain before they are lost completely to us.

L. S. Hannibal,
Executive Secretary

October 30, 1943

REPORT OF THE TRIAL COLLECTIONS COMMITTEE

Due to the present emergency the number of accessions has reached an all time low. The few items received however are very choice.

Members are urged to remember the Society with sample lots of seeds and bulbs of rare, new or unusual amaryllids which they may come upon anywhere.

The following Hybrid *Cyrtanthus* produced by Mrs. J. Norman Henry, Gladwyne, Penna., and introduced in 1943 (see description under "Registration of New Clones" elsewhere in this issue) have been donated to the Society for distribution as soon as sufficient stock has been propagated:

- A-312—*Coral Reef* (H-1)
- A-313—*Fairy* (H-2)
- A-314—*Venus* (H-3)
- A-315—*Red Gem* (H-4)
- A-316—*Topaz* (H-5)

Rancho Rinconada,
Ojai, California,
November 15, 1943

W. M. James, Chairman,
Trial Collections Committee

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Founded 1933; incorporated 1943

1943-44

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 Dr. J. S. Cooley, *Maryland*

[Additional members to be appointed later; members of the Hemerocallis Jury are ex-officio members.]

HEMEROCALLIS JURY FOR EVALUATING DAYLILIES—Dr. Kenneth Post,
Acting Chairman, Cornell University, Ithaca, N. Y.

Those in charge of Official Cooperating Trial Gardens are ex-officio members of the Daylily Jury.

[Reports from official trial gardens, indicated below, should be made directly to Dr. MacDaniel, Chairman, by July 1 in order to be included in annual summary for HERBERTIA.]

OFFICIAL COOPERATIVE DAYLILY TRIAL GARDENS

Prof. John V. Watkins, in charge of Daylily Trial Garden, College of Agriculture, University of Florida, Gainesville, Fla.	Dr. Raymond C. Allen, in charge of Daylily Trial Garden, Dept. of Agriculture, Cornell University, Ithaca, N. Y.
Dr. Paul L. Sandahl, Supt., in charge of Daylily Trial Garden, Dept. of Parks & Public Property, City of Des Moines, Iowa.	Dr. Walter S. Flory, in charge of Daylily Trial Garden, Division of Horticulture, Texas Agric. Expt. Sta., College Station, Texas.
Prof. Ira S. Nelson, in charge of Daylily Trial Garden, Dept. of Horticulture, Southwestern Louisiana Institute, Lafayette, La.	Mr. Chas. E. Hammersley, 714 Majestic Building, Milwaukee, Wisc., in charge of Daylily Trial Garden, Milwaukee City and County Parks.

Note.—Introducers of new daylily clones should send plants directly to the Trial Gardens for testing.

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PUBLICATIONS OF THE AMERICAN AMARYLLIS SOCIETY

A complete file of *HERBERTIA*, the year book of the American Amaryllis Society, is indispensable to all who are interested in Amaryllids. A limited number of copies of the following are still available:—

Volume 1 (1934). DEDICATED TO HENRY NEHRLING. Containing the biography of Henry Nehrling, and many valuable articles on amaryllids; with a portrait of Henry Nehrling and 16 other illustrations; a total of 101 pages.

Volume 2 (1935). DEDICATED TO THEODORE L. MEAD. Containing the autobiography of Theodore L. Mead, and many excellent articles on varieties, breeding, propagation, and culture of amaryllids; with portraits of Theodore L. Mead and David Griffith and 18 other illustrations; a total of 151 pages.

Volume 3 (1936). DEDICATED TO ARTHINGTON WORSLEY. Containing the autobiography of Arthington Worsley, and important articles on description, genetics and breeding, physiology of reproduction, and amaryllid culture; with 3 portraits of Arthington Worsley, one color plate and 30 other illustrations; a total of 151 pages.

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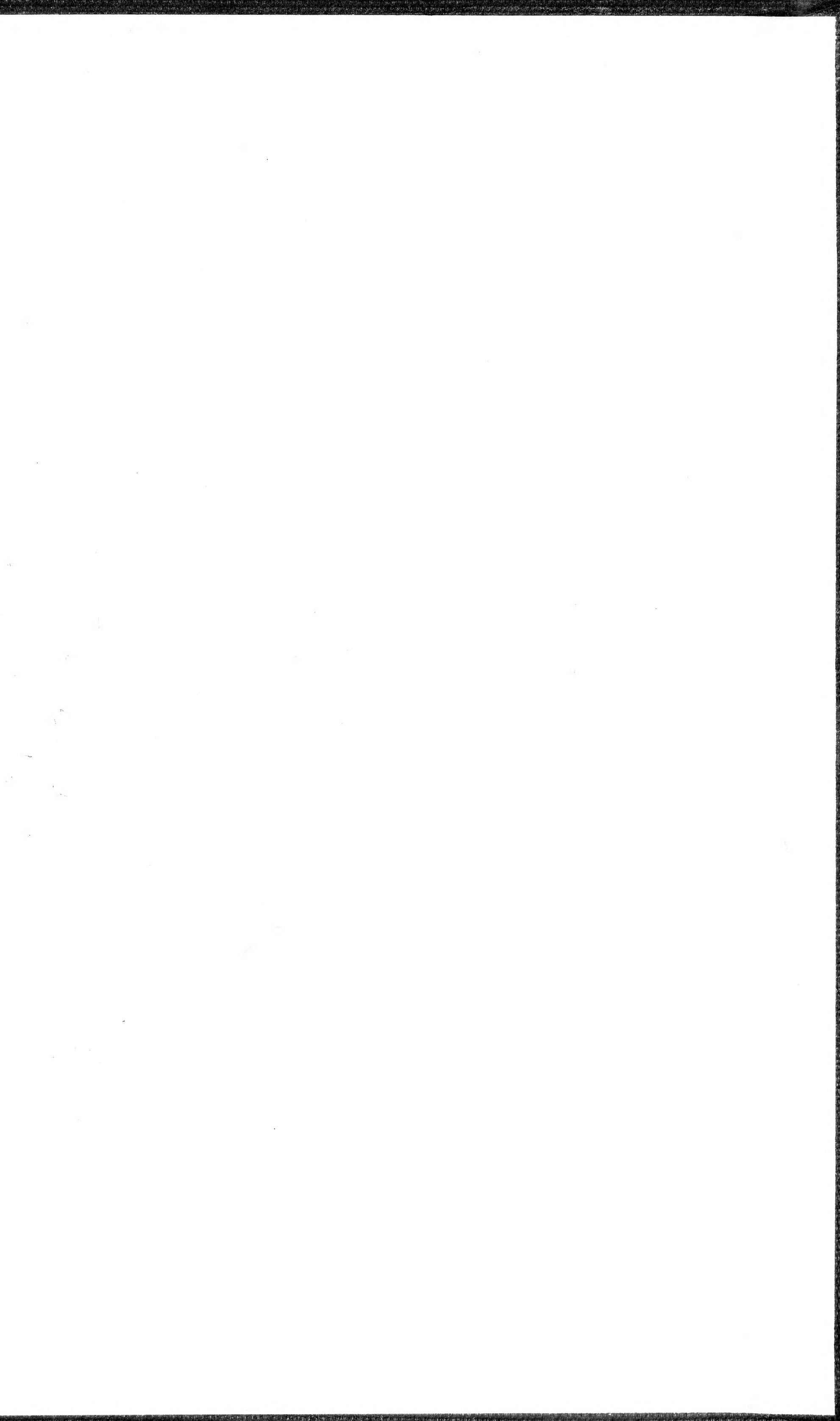
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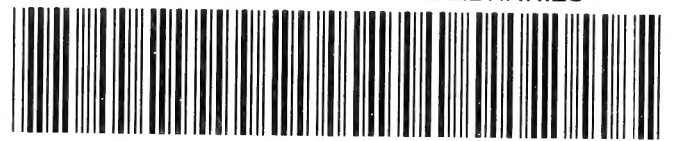
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